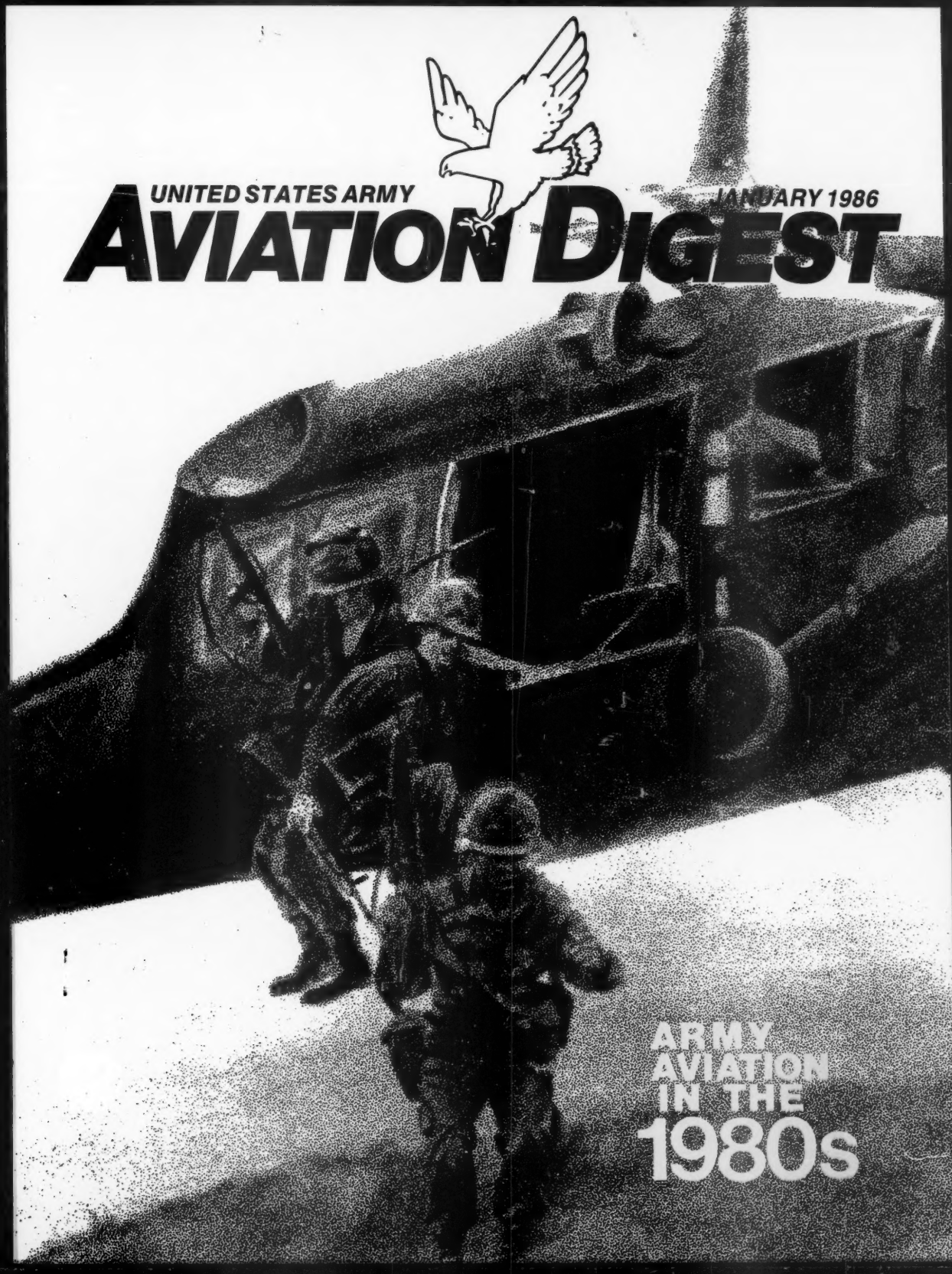
UNITED STATES ARMY

# AVIATION DIGEST

JANUARY 1986



## ARMY AVIATION IN THE 1980s

JANUARY 1986 • VOLUME 32 • NUMBER 1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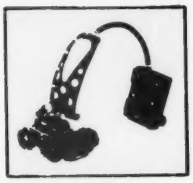

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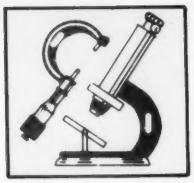

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**Cover:** **Army Aviation must *now* learn how to maximize its inherent mobility, agility and firepower. Aviation needs to develop it means to fight, support and manage the technologies required for optimum employment in the air-land battle. The article by LTG RisCassi begins on page 2. Cover art by Robert D. Sloan is 1 of 12 reproductions offered by the Army Aviation Museum Foundation.**


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The mission of the *U.S. Army Aviation Digest* (USPS 415-350) is to provide information of an operational, functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, Aviation medicine and other related data.

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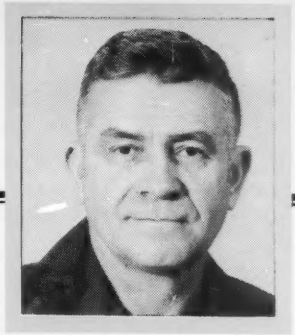
**Major General Ellis D. Parker**
Chief, Army Aviation Branch



## NTC Lessons Learned

THE AVIATION CENTER is involved with the full integration of Aviation as an element of the combined arms team.

One significant effort to further this objective involves the increasingly important role of Army Aviation at the National Training Center (NTC), Ft. Irwin, CA. It is there, in the Army's most realistic training environment, that Aviation units participate with ground maneuver units during force-on-force and live fire exercises designed to test each unit's tactical expertise. Several major trends have been identified in these exercises that are significant for all Army Aviation units. While some of these lessons learned are specific to the NTC, most are applicable to any deployment situation, real or simulated.

Movements to the NTC have taught us the value of adequate quantities and size/configuration of materials handling equipment (MHE). Shortages of MHE at both embarkation and debarkation sites create major logistics burdens on the unit and the NTC. To preclude this difficulty, commanders must ensure that the necessary equipment is identified early during deployment planning and is either pre-positioned or added to shipped stocks. The Aviation Center is working with U.S. Army Training and Doctrine Command, U.S. Army Forces Command, Ft. Eustis and the U.S. Air Force to identify a support package for future positioning at Norton AFB, CA, to assist unit deployments.

For most aviation units, the NTC is at the end of a long and uncertain supply line. Repair parts, tools and special test, measurement and diagnostic equipment are extremely difficult to obtain when needed most. Careful planning is essential to having packed the correct "combat authorized stockage list/prescribed loading list." This lesson is vital to success in real deployment situations and begs full-time attention.

The Multiple Integrated Laser Engagement System (MILES) is key to success in force-on-force training at the NTC. Aviation units repeatedly encounter difficulties installing, boresighting and operating MILES equipment. These difficulties are attributed to both equipment limitations and user unfamiliarity with MILES requirements. All pilots, crewchiefs and armament personnel need hands-on training at home station to minimize problems at the NTC. Although perhaps somewhat excessive to normal telescopic sight unit requirements, the need to frequently boresight weapon systems cannot be ignored as a "real" lesson learned. Because airborne TOW missile engagements are electronically indistinguishable from ground TOW engagements, the observer/controller (O/C) must determine the effectiveness of the attack helicopter force. Close coordination/communication between the unit and the assigned O/C is essential for correct representation of aviation on the battlefield.

The rapid pace of battle at the NTC highlights the need for direct coordination between ground and aviation units to ensure that operations are planned indepth within the task force sector of influence. An effective Aviation liaison officer (ALO) can bridge this coordination gap by ensuring integration of aviation assets into the task force's scheme of maneuver. The ALO, as the ground element's aviation expert, is the key to effective ground-air interaction and hence to the success of the aviation unit in the combined arms team. Two-way communication between aviation and ground tactical operations centers is essential to coordinate the ever-changing requirements of combat operations.

Experience has shown that the optimal aviation unit structure is a full H-series company with battalion staff augmentation, or a J-series battalion with staff. Inclusion of aviation staff elements combined with early identification of deploying units and extensive predeployment planning has facilitated the coordination necessary to successfully integrate aviation and ground unit training during the NTC experience.

The National Training Center provides Forces Command aviation units with unique training experiences that cannot be found anywhere else within the continental United States. The NTC places combined arms task forces in the most realistic environment possible, short of actual armed conflict. The opportunities to maneuver and execute combat operations against a formidable opposing force cannot be duplicated elsewhere. The lessons we are learning at the NTC must be continually evaluated for contributions that will improve future training rotations. The continued integration of aviation into the fighting force at the National Training Center will assure Army Aviation's place as a member of the combined arms team, and it is essential to our success on any future battlefield.

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*Next month watch for more on the NTC in the article entitled "Not Just Another Field Problem" by SFC Michael Shay.*

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THE ACHIEVEMENTS of Army Aviation during the first half of this decade have earned the Aviation community the congratulations of the rest of the Army. These attainments also have served to lay a solid foundation for the future challenges awaiting Army Aviation during the remainder of the decade and beyond. The same initiative, imagination and hard work that went into the accomplishments of the last 5 years must continue.

The Army as a whole is now at a major decision point. Recent developments in air-land battle doctrine and the tactics, organizations and technology to support that doctrine give the Army the potential to introduce revolutionary advances in warfighting. We have the opportunity *now* to revolutionize warfare in the latter half of the 1980s as

# ARMY AVIATION IN TH

## *The Successes of the First 5 Years,*

**Lieutenant General Robert W. RisCassi**
Commander
U.S. Army Combined Arms Center
Fort Leavenworth, KS

blitzkrieg mechanized forces did in the 1940s.

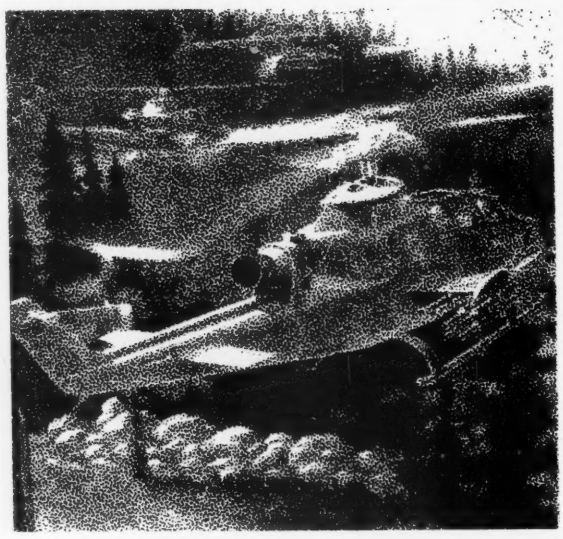
For us to bring that potential to reality will require great efforts on the part of the entire Army community to realign our thinking, our tactics, our organizations and our equipment with the fresh opportunities presented by new doctrine and technology. From the military perspective we must be able to meet the 21st century now.

On the aviation side, the greatest challenge lies in employing the new combat strengths of Army Aviation that the successes of the past have created. Our doctrinal and tactical thinking must keep pace with the revolutionary changes in aviation itself as we seek to overlay Army Aviation as a "maneuver" force on the dynamic, fast-paced modern-day battlefield.

# E 1980s

## *The Challenges of the Second*

**Extensive training in air-land battle tactics and doctrine through advanced technology has earned Army Aviation acceptance into the combined arms team as a combat arms branch. Now, applying lessons learned on the modern air-land battlefield presents other challenges. How must the Army Aviation community address them?**



The UH-60 Black Hawk (above), the Army's newest utility helicopter, was designed to meet the requirement for battlefield mobility and survivability.

The AH-1S Fully Modernized Cobra (left) packs a devastating punch as an Army antitank attack helicopter.

## The Successes of the First Half

At this juncture it is useful to recognize some of the accomplishments of Army Aviation during the last 5 years. These significant advances are perhaps best reflected by Army Aviation's acceptance into the combined arms team as a full-fledged combat arms branch. While maintaining its traditional technical flight training, Aviation Branch has taken the opportunity to build the Aviation Officer Basic and Advanced Courses and has extensively modified the Warrant Officer Advanced and Senior Courses. Additionally, enlisted instruction has been broadened to ready the force for more technologically advanced equipment. Across the board, the Aviation community has made great strides in teaching Army Aviation soldiers to fly and fight as members of the combined arms team.

Concurrently, Army Aviation has been a leader in developing and fielding new systems. The UH-60 Black Hawk, the AH-64 Apache, the modernized AH-1S Cobra, the CH-47D Chinook, and soon the OH-58 Kiowa Army Helicopter Improvement Program (AHIP) will augment the trustworthy UH-1 Huey and will provide the Army with an aircraft fleet capable of meeting the challenges of air-land battle into the 21st century. Training systems including the Multiple Integrated Laser Engagement System/Air-to-Ground Engagement System, cockpit technique and combat mission simulators, and tactically oriented battle drills provide the wherewithal to train soldiers on how to fight and fly these advanced aircraft to their maximum performance potentials.

Of all the achievements of the last few years, the combat Aviation brigade shows the greatest promise for allowing Army Aviation to be employed to its fullest capability on the air-land battlefield. On the training side, the inclusion of the combat Aviation brigade in the divisional force structure allows full peacetime practice of wartime combined arms skills. Integrating a brigade-level Aviation headquarters into the daily operations of the division has made Aviation a full-time member of the combined arms team and has created an unprecedented amount of experience in using Aviation in combined arms operations at all levels.

On the tactical side, the Aviation brigade gives the division commander a command and control headquarters with the ability to project a strike force optimizing the speed and agility of the helicopter while concurrently synchronizing the support provided by Army Aviation elements across the entire operational area. Aviation, by its presence on the battlefield, permits the division to integrate aviation assets into operations much more effectively than in the past. Further, the brigade-level headquarters is well suited to the task of orchestrating supporting elements such as suppression of enemy air defense (SEAD), intelligence and electronic warfare, and joint air attack teams with attack helicopter operations. Overall, this brigade-level integration of aviation into the combined arms team is a significant step toward ensuring optimal use of Army Aviation.

AH-64 Apache adds mobility and firepower to the modern battlefield.

## Challenges of the Second Half

From the combined arms perspective, one of the greatest challenges the Army faces today lies in learning how to maximize the unique capabilities of modern Aviation—its inherent mobility and agility. Generally, maneuver arms can be said to operate on three different levels of mobility. Foot-mobile light infantry, with its ability to make greatest use of terrain, operates at the lowest level of mobility. Mechanized and motorized forces, with the greater speed of tracks and wheels, operate at a higher level. By using the rotor blade to break friction with the ground, Aviation units gain the highest level of mobility—at considerable cost in dollar resources and highly trained personnel. Indeed, the Army pays a premium price for the enhanced mobility of Aviation.

The Army must get the greatest possible return for this investment in Aviation as it contributes to the combined arms team. In the area of combat assault and combat support Aviation, where Aviation lends its mobility differential to other arms, we are refining doctrine to make the most of our investment. Air assault, artillery lift, aerial-delivered mines, airborne command and control, etc., benefit all arms by adding the leverage of Aviation's mobility to their individual inherent strengths. Efforts to optimize this aspect of Aviation are generally on the right azimuth, but we need to apply even greater imagination and innovation *by employing* the advantages of combat assault and combat support Aviation to support air-land battle doctrine.

The aspect of Army Aviation that combines both mobility and firepower—the attack helicopter—offers the greatest likelihood in using its revolutionary potential to add yet another dimension of maneuver to air-land battle. Traditionally, we have tied attack helicopters to support of ground maneuver elements by employing them as part of the battalion combined arms team or as a "fire brigade" to react to a rapidly developing enemy threat. However, tying attack helicopters to ground elements may lead to less than optimal employment for several reasons.

First, it does not allow commanders to take maximum advantage of the attack helicopter's greatest assets—agility and mobility. Further, it causes the attack helicopter to operate in the forward line of own troops environment where it is more vulnerable to concentrated air defense artillery and artillery. Additionally, command and control of supporting attack helicopters often exceeds the capability of the battalion combined arms team. Employment of attack helicopters in support of ground maneuver forces worked adequately with *active defense* doctrine, but relegating them to a supporting role limited their effectiveness for the reasons cited.

Air-land battle doctrine and the enhanced capabilities of the newer attack aircraft offer opportunities to employ attack helicopters to greater advantage. By using attack helicopters to strike at enemy weakness wherever it may be found, to mass firepower quickly, to disperse before the enemy can react and to mass again for yet another attack, the commander now can cause the battle to become truly multidimensional. The full power of maneuver embodied in the attack helicopter can make turning *inside* the enemy decision cycle a reality as the enemy attempts to react to a threat that can be anywhere—at any time.

While the factors of mission, enemy, troops, terrain and time will often cause commanders to continue employing attack helicopters in support of ground maneuver forces, there also will be numerous opportunities when commanders will want to take maximum advantage of the

AH-64 Apache is designed for day, night and adverse weather conditions.

**The Army's latest scout helicopter, the OH-58D AHIP, teams with the AH-64 Apache to provide mobility and firepower on the air-land battlefield.**

inherent maneuverability and firepower of attack helicopters and employ them in pure formations. Of all forces, attack helicopters are in some ways best suited to meet the tenets of air-land battle—*depth, initiative, agility and synchronization.* Additionally, the 70 plus kilometer operating radius and the responsiveness of attack helicopters allows the commander to position them so that they:

- can swiftly switch their focus from deep, to close-in, to rear operations;
- can respond rapidly to a changing situation; or
- can take advantage of an opportunity created on the battlefield.

Use of attack helicopters in deep operations can reap great benefits for the division commander by allowing him to "shear off" the close-in battle from the enemy's second echelon. Analogously, the maneuver brigade commander can employ attack helicopters as brigade assets in close-in operations to isolate lead elements of the opposing force from their follow-on echelons and defeat them in detail. Here, we need to make wise use of the command and control capacities of the combat Aviation brigade; and, we need to streamline our operational support relationships to allow the rapid switching of attack helicopters from role to role as the focus of the battle shifts.

Pure attack helicopter organizations also offer great promise for the critical rear battle, particularly in countering the attack helicopter threat to our rear areas. With enhanced detection and warning, attack helicopters might have the ability to provide rapid reaction against enemy attack helicopters or air assault attacks en route to lucrative rear-area targets. Here, the "protective" air-to-air role of attack helicopters employing new air-to-air tactics and systems may have great potential.

## Challenges for the Aviation Community

Determining how to optimize these applications of Army Aviation in support of air-land battle doctrine will, as a minimum, pose the following challenges to the Army Aviation community:

- With the Command and General Staff College (Ft. Leavenworth, KS), develop appropriate doctrine and tactics for the optimal integration of attack helicopters into corps operations to include deep maneuver and deep strikes.

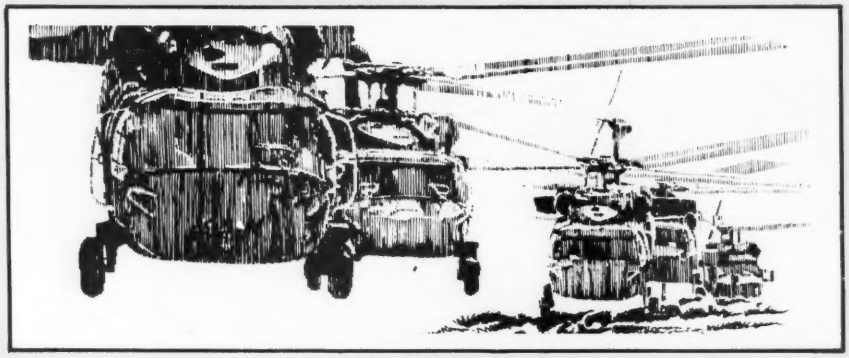
- Develop "How to Fight" for Aviation to include:
  - Battle drills with combined arms and the Air Force.
  - Roles and missions of Army Aviation in protective air-to-air combat and integration with air defense in the antihelicopter role.
  - SEAD operations, both joint and without Air Force cooperation.

- Develop "How to Support" for Aviation in the air-land battle to include:
  - Concepts for enhanced Class III (petroleum and solid fuels) and V (ammunition) support.
  - Maintenance support for sophisticated technologies in harsh environments and under primitive conditions.

- Develop "How to Train" to include:
  - Concepts for tactical training to execute air-land battle with other elements of the combined arms team.
  - Training simulators which capture emerging technology to integrate Aviation in realistic combined arms battle simulations at all levels.

- Develop a strategy for managing the technologies required to optimize Aviation's employment in the air-land battle:
  - With the Army Materiel Command, develop a plan to get advantageous technologies into the hands of Aviation soldiers as rapidly as possible.
  - Continue the thrust of employing new technologies to enhance aircraft speed, flexibility and survivability through programs such as the Light Helicopter Family.
  - With the command, control, communications and intelligence community investigate the capability to put operational intelligence *immediately* into the cockpit and to transmit intelligence from the cockpit to ground elements.
  - Investigate the systems required to optimize Aviation's participation in the antihelicopter role.

The above is, at best, a partial list of the challenges facing the Army Aviation community as it gains release from conventional thought and moves, with pride, into the second half of the decade of the 1980s and toward the 21st century. The major task at hand—determining how best to employ the revolutionary new Army Aviation weapon, so carefully crafted and honed during the first half of the decade—is a difficult one demanding all of the skill, initiative and dedication that the Army Aviation community has demonstrated so amply in the past.



**The UH-60 Black Hawk is the Army's newest utility tactical transport aircraft capable of meeting the challenges of air-land battle into the 21st century.**

GOAL –
$2,500,000
January 1986 –
$1,900,000
cash and pledges

# Army Aviation MUSEUM

*This is a series about the Army Aviation Museum Foundation fund drive. Currently, plans call for building a modern complex to house your Army Aviation Museum. Since last month additional donations have been received. However, we still have a ways to go, as the barometer above shows. If you would like to help "build" the Army Aviation Museum's new home, you are invited to send a tax deductible contribution to: The Army Aviation Museum Foundation, Box 610, Ft. Rucker, AL 36362-5000. If you desire additional information call Mr. Ed Brown at (205) 598-2508.*

## A Look At What's In Your Museum

L-19A Bird Dog

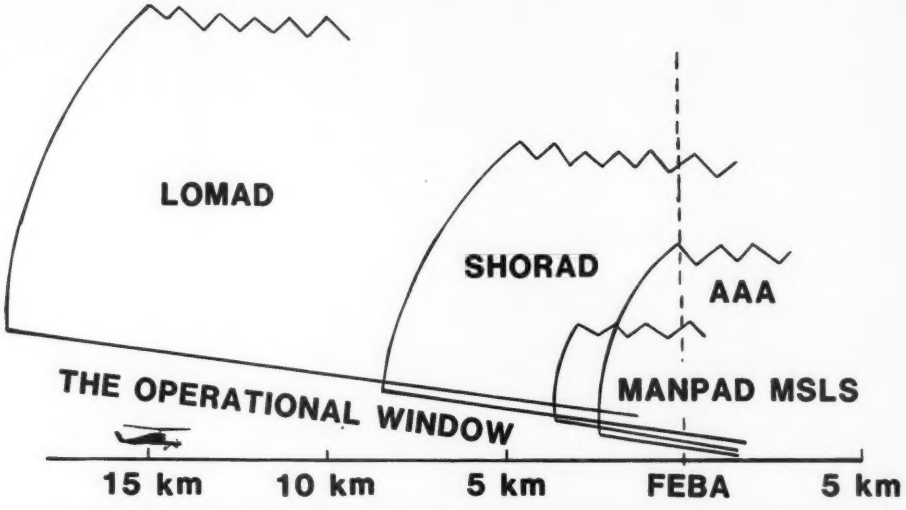
The L-19A shown "1327" was one of the first liaison and observation fixed wing aircraft developed exclusively for the U.S. Army Field Forces after World War II. Cessna Aircraft Company, Inc., won the design competition with this off-the-shelf, modified-cockpit-area aircraft. Number 1327 on display has a very distinguished history; it was the first L-19A shipped overseas in 1951; became the first L-19A delivered and used by the Republic of Korea forces for training and operational flights; and was the last of the fixed wing observation aircraft used by the Army. This plane was also used as the basis for the L-19 "Pilots" handbook.

While in Korea, it served as a personal observation aircraft for Generals Van Fleet, Ridgeway and Taylor, and later served as a liaison aircraft for General Choi Yong Dok, Republic of Korea chief of staff. After serving as a fixed wing trainer at the U.S. Army Aviation School, it was transferred to the U.S. Army Aviation Museum in 1958. In 1962, the aircraft was redesignated 0-1A.

MONTHLY WRITING AWARD

THREAT

**Mr. Edward J. Bavaro**
Threat Branch
Directorate of Combat Developments
U. S. Army Aviation Center
Fort Rucker, AL




**The "operational window," in which attack helicopters can effectively operate, is created by the inability of antiaircraft artillery guns to reach out to the standoff ranges some of the attack helicopter weapons allow and because current surface-to-air missiles are unable to sort out the targets from the ground clutter.**

# CLOSING THE WINDOW

THE SOVIETS HAVE long recognized the threat that the attack helicopter poses to their armored forces.

The growing family of North Atlantic Treaty Organization (NATO) member attack helicopters optimized for antiarmor engagements represents a major obstacle the Soviets must contend with if they are to sustain the tempo of their offensive thrusts. The Soviet concept of war requires the application of shock power through the concentrated employment of armor in a fast moving, fluid battle. The Soviets concede that attack helicopters are the most effective combat system as regards observation and maneuverability and choice of time and place for delivering a blow against their armor. See "How to Fight Helicopters," Colonel M. Belov, *Aviation Digest,* October 1981.

Experience from the Yom Kippur War of 1973 as well as the lessons learned, derived from numerous exercises, have shown that many strikes can be conducted by attack helicopters against armored forces without entering the antiaircraft (AA) defense area.

With forces in a static posture, the Soviet air defense (AD) systems suffer a deficiency in AD protection. An open window is created by the inability of their antiaircraft artillery guns to reach out to the standoff ranges

**The DShK is a 12.7 mm machinegun used on medium tanks and armored personnel carriers for antipersonnel and antiaircraft roles.**

some of the attack helicopters' weapons allow or because their surface-to-air missiles (SAMs) are unable to sort out the targets from the ground clutter.

In a mobile situation, this AD umbrella of the Soviet offensive forces is further disadvantaged, opening the operational window for the attack helicopters even more, because detection systems are less efficient and some weapon systems less effective while on the move.

As the tempo of operations increases, the problems of coordinating ADs will become almost unmanageable, with gaps developing in the air umbrella. Air defenses have a tendency to sag behind the forces they are protecting, furthering the opportunities for attack helicopters because the window is opened further.

These attack helicopters using much more sophisticated target acquisition systems and weapons, and possessing varying suites of aircraft survivability equipment (ASE), represent a more tenacious, less fleeting threat to Soviet armor. The obvious question then is, "How will the Soviets go about reducing this window and restrict the operational latitude of attack helicopters?"

One of the first things the Soviets can do—they are, in fact, doing! That is, employing small arms fire in AA roles. Small arms are being stressed in AA training because the Soviets are convinced that any kind of gunfire will have a deterrence value: Gunfire, especially tracer fire, will distract the pilots and gunners to some degree. The Soviets also feel that small arms can be effective against helicopters and that some vital parts of the heli-

**The DShK 12.7 mm machinegun, shown below on a T-72 tank, is also used on some BRDM (Russian reconnaissance) vehicles. The 14.5 mm KPVT machinegun is used on BRDM-2 and BTR-60/70 vehicles. Some BMPs (Russian infantry combat vehicles) have replaced the 73 mm cannon with an automatic 30 mm cannon.**

copter are susceptible, particularly those areas not protected by armor plating.

From their experience in Afghanistan, they believe that small arms firing head-on at approaching targets take advantage of the projectile energy, preferably penetrating into the crew compartment or into the engine/transmission/rotor area. They will attempt to bring to bear as many weapons as they can against attacking helicopters, including antitank weapons. When not engaged in combat, each unit designates an "air alert" section that maintains vigil for their unit, looking for attacking helicopters.

Routes of approach suitable for armed helicopters and positions from which these helicopters might employ antitank guided missiles (ATGMs) are of special concern. Soviet commanders are trained to observe areas masked by trees or folds in the terrain that might be used by enemy aircraft using nap-of-the-earth flight techniques to avoid radar detection. When attacking aircraft are spotted, the air alert teams engage them at once. Their fire is followed by the other weapons in the unit, with the air alert commander providing range and direction information throughout the unit. Sudden and intense ground fire from an unexpected location or direction can degrade aircrew performance and cause crews to fire their weapons prematurely or force them to break off their attack.

In Soviet tank units, their procedure is to stop and engage the helicopter momentarily; if the helicopter is not hit, then the drivers are ordered to advance, moving at high speed, sharply changing direction right and left continuously until their tanks reach the next stopping point. Staying put means becoming too good a target for the helicopter. The tankers will fire their machineguns at ranges less than 1,000 meters; beyond that, the tankers will use main guns with high explosive (HE) ammunition being the preferred round against helicopters. Another type of ammunition probably will be fired at helicopters only if it is already loaded in the main gun or if the automatic loader is out of HE ammunition.

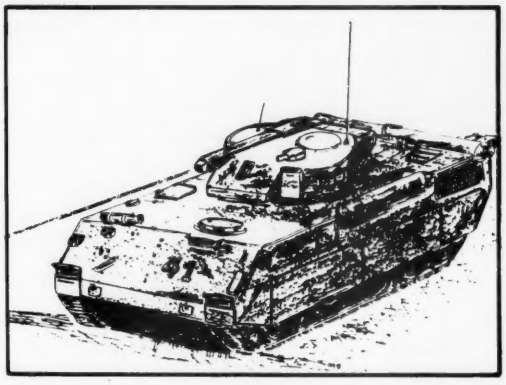
The T-80 and T-64 tank variants can fire ATGMs at much greater ranges than the conventional tank ammunition, seriously reducing the attack helicopter's edge in standoff engagements. These missile firing tanks are ideal for overwatch responsibilities because of the range of their ATGMs and because of the ATGM application against helicopters.

The Soviets may employ AD ambushes and roving units to increase flexibility and effectiveness of their AD effort. These ambush and roving AD elements can be composed of a single AA gun, section or platoon; independent SA-7 SAM squad; or a combination of guns and missiles. The AD ambushes are frequently used along *less likely* enemy aircraft approach routes, but approach routes with possible use for surprise attacks by virtue of their unlikeliness. Radar elements may support an ambush unit. These AD ambush units immediately displace and relocate after an engagement. Roving units are similar to ambush units except that they move from a series of predetermined locations, especially those most likely areas of enemy air attack. Ambush and roving units can make the enemy think that significant AD elements are located in areas where there are only a few weapons. This can reduce the effectiveness of enemy reconnaissance and decrease the likelihood of enemy air attack in the area concerned.

While this use of individual and crew served weapons to augment the AD effort should produce some results, its overall impact should be minimal and not deflect NATO attack helicopters from attacking and from attriting Warsaw Pact armored forces at a favorable ratio. The main problem for these small arms systems will be their ineffectiveness during night operations, when they will suffer the lack of integration with a target detection and direction system to alert and guide their actions. Off-line systems probably cannot relay targeting data timely enough to produce anything other than occasional random hits.

Another thing the Soviets may try in order to reduce the operational window of attack helicopters, is to add lasers to their organizational AD assets. Lasers hold a distinct advantage in AD applications. When lasers are used in an AD system, the problems of lead and ballistic trajectory are virtually eliminated. A laser beam is not greatly affected by gravity or target motion. Heretofore, weapons

**The laser system probably will be mounted on a tracked vehicle to allow it to move with attacking Soviet forces.**



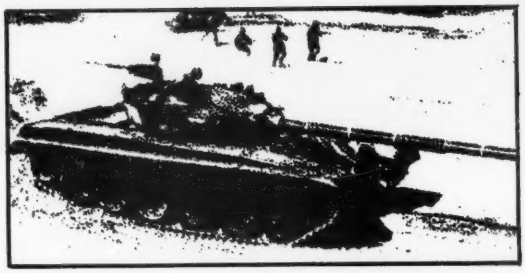
**The extensive use of automatic small arms weapons and the machineguns/cannons on the numerous Soviet combat vehicles allows Soviet ground forces to put up a massive amount of firepower against low flying aircraft.**

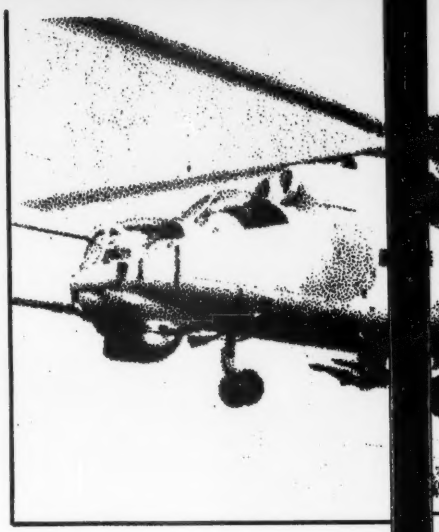
on the battlefield used the kinetic and/or chemical energy of a projectile to defeat a target. A directed energy weapon such as the laser, on the other hand, depends upon the delivery of subatomic particles or electromagnetic radiation (focused into narrow beams). The particle beam traveling at or near the speed of light impacts on a target and inflicts damage on that target.

The Soviets may be real close to fielding a laser AD weapon. The 1983 issue of *Soviet Military Power* (in speaking of directed energy weapons) says, "Soviet development of moderate power weapons capable of short-range, ground-based application, such as tactical AD and antipersonnel weapons, may well be far enough along for such systems to be fielded in the *mid-1980s.*" The chart below compares a typical AD weapon to a laser AD system against a target at a 3-kilometer (km) range.

**The extensive use of automatic small arms weapons and the machineguns/cannons on the numerous Soviet combat vehicles allows Soviet ground forces to put up a massive amount of firepower against low flying aircraft.**

| Type | Avg Speed of Round (M/Sec) | Time of Flight | Target Type | Crossing Velocity (km/hr) | Lead Required (meters) | Vertical Drop of Round (meters) |
|---|---|---|---|---|---|---|
| Gun | 680 (Mach 2) | 4.41 | Jet plane | 1,224 (Mach 1) | 1,500 | 95 |
| Gun | 680 | 4.41 | Helicopter | 100 | 123 | 95 |
| Laser | $3 \times 10^8$ | .00001 | Jet plane | 1,224 | .003 | 0 |
| Laser | $3 \times 10^8$ | .00001 | Helicopter | 100 | .0003 | 0 |





**Soviet armor attrition by attack helicopters could slow or delay the advance and even cause preemptive commitment of the second echelon.**

So, here we have a typical AD gun system engaging a jet aircraft at a 3-km range that is traveling at Mach 1. The gun computer must calculate a 1,500-meter lead for that target range of 3 km and compute the adjustment of the vertical drop of its rounds of 95 meters. Compare this to the laser, requiring a lead of .003 of a meter (less than an *inch*) with no vertical drop of the beam. This represents a rather impressive improvement over conventional AD systems.

Some of the other advantages of laser AD systems are the lack of any recoil, which simplifies vehicle packaging; a variety of target effects from sensor damage to structural damage; and the imposition of a requirement for unique countermeasures. The addition of laser weapons to the Soviet AD array of weapons could push back that "window" our attack helicopters must operate in, unless effective laser countermeasures are developed and used in support of the attack helicopters and protective measures are added to ASE suites of attack helicopters.

Finally, the Soviets are likely to seek to reduce the operational "window" of NATO attack helicopters by the use of "fighter helicopters" as suggested by Belov in his "How to Fight Helicopters" article. Belov talks of two approaches to combat helicopters employed in antihelicopter roles. The first approach is to use general purpose helicopters, some of which would be designated for antihelicopter operations. The other approach is to develop "fighter helicopters" to destroy enemy combat helicopters and other aerial targets.

The Soviets generally have opted for the general purpose solution historically, preferring this less risky proposition rather than the special design, single purpose systems. The cost issue is usually the governing criteria as cheaper developmental costing frequently favors the general purpose helicopter approach. But the level of technology involving airframes, propulsion, weaponry and other subsystems such as target acquisition and fire control systems is becoming so sophisticated that a general purpose vehicle simply cannot cut the mustard.

This uncertainty over which approach to use may explain the emergence of the Havoc and the Hokum developmental programs. The Havoc appears to be the general purpose attack helicopter, mainly intended for combat air support roles with a capability to perform air-to-air against other helicopters. The Hokum, on the other hand, appears to be tailored for the air-to-air requirement. Whether the Soviets are undertaking this parallel development to decide which approach (general or special purpose design) is best or whether they simply are producing a Hind successor and a fighter helicopter simultaneously, is something that will have to be determined. In either case, some form of attack helicopter will be out there seeking our attack helicopters.

The fighter helicopter could come armed with cannon and some form of air-to-air missile. Probably the cannon will be at least 20 mm to 30 mm in caliber to provide reasonable range and punch, making it comparable in performance to NATO attack helicopter cannons. The

**Soviet attack helicopters increasingly will be forced into antihelicopter operations to further restrict NATO helicopters' operational window.**

Soviets feel that the cannon is the more reliable weapon for close combat; however, the problem with cannon engagements is the relatively short range of the guns vice the air-to-air missiles.

In aerial encounters, the aircraft getting his licks in first has the advantage. This advantage is greatly enhanced by having a superior target acquisition system to increase the element of surprise by early detection and being able to get your missile off at near-maximum range. Another thing about a missile is its greater destructive force, especially when you consider most air-to-air engagements will only allow for one shot/burst. Helicopter air-to-air will not be a dogfighting type combat, but rather a swift engagement followed by energetic maneuvering to try to get a favorable position to fire again—or to disengage. This is where speed and agility of the aircraft pays dividends, allowing the pilot to either press home his attack or to swiftly disengage as dictated by the situation.

The Soviets will rely on some air-to-air missile to complement their cannon as they attempt to restrict further the operational window of NATO attack helicopters. The cannon will be the means by which they will suppress ground AD weapons as they move to protect their ground forces. The effort of these fighter helicopters will be coordinated, when possible, with their ground forces for mutual support and protection. Engagements between helicopters will generally involve groups of helicopters. The Soviets have adapted many tactics and techniques from their fixed wing combat procedures using pairs, flights and even units (squadrons) for combat. Single helicopter combat, while possible, is unlikely.

The most important aspect of the use of fighter helicopters against NATO attack helicopters is that they may have some form of night fighting capability where a target acquisition system such as a forward looking infrared radar is tied to an automatic fire control system. A fighter helicopter would prefer a passive system such as an infrared sensor for detection to minimize the possibility of being detected in return. A radar system for backup would provide a degree of flexibility (redundancy) and would provide targeting data such as range and speed for the computer. Millimeter wave radars have small antennas and provide good resolution; they also have very good adverse weather penetration and are not greatly affected by ground clutter.

Recognizing that the Soviets will be forced into antihelicopter operations, our initial development of the air-to-air Stinger, which would be mounted on the OH-58D or the Light Helicopter Family-Scout/Attack, is significant. Scout aircraft armed with the Stinger will attempt to forestall Soviet fighter helicopter efforts against our attack helicopters. Our objective has to be one of maintaining the viability of the attack helicopter and its effectiveness in antiarmor roles: We will have to prop that window open. But the point is, the Soviets are going to continue trying to close that window. Operating in that window was no free lunch with conventional Soviet threat systems. Expect things to get even tougher.

# Is anybody paying attention?

U.S. ARMY SAFETY CENTER

LCol Andy Seguin
Investigation and Prevention
Directorate of Flight Safety

**Human error is the most commonly cited cause of aviation accidents worldwide. The problem is the same in U.S. Army Aviation where as many as 80 percent of the total accidents are attributed to some type of human error.**

**Human error may be a flight crew failing to follow procedures; but it can also be a supervisor who fails to manage risks at unit level or failure by ground crews to perform maintenance "by the book." These are all human errors, and they all cause accidents.**

**Because it is such a pervasive cause factor in Army Aviation accidents, human error has been targeted in SafeArmy 1990. SafeArmy 1990 is a 5-year plan designed with Army safety program goals that will support the Secretary of the Army/Chief of Staff Army goals for the total Army.**

**To support the Army goal of resource conservation, we must substantially reduce accident losses in all major areas, establishing and maintaining an improved accident trend. In simple terms, we must do more to prevent accidents. One of the elements of the prevention program is increased attention and emphasis on human error. An awareness and education campaign will be part of that effort; however, little will be accomplished if people aren't paying attention.**

**The following article, is reprinted from *Flight Comment,* a publication of the Directorate of Flight Safety, National Defence Headquarters, Canadian Armed Forces. This article could well have been written about the U.S. Army Aviation accident experience. It sets the stage for future articles in *Army Aviation Digest* and *Flightfax* on the human factor in Army Aviation.**

Here at Directorate of Flight Safety (DFS) we have well over 100,000 aircraft occurrence reports, both accidents and incidents (Air and Ground) filed either in our Aircraft Accident Incident Reporting System or on first generation handraulic cards. Each year we add 3,000 more reports to our case bank. Each case represents a system failure or a hazard to our aviation assets and is closed off with a cause factor or factors and includes preventive measures which are intended to prevent further occurrences of that nature. Preventive measures are many and varied but by far, the most popular is the universal "All personnel (pilots, technicians, etc.) briefed."

Incident reports are not the only documents which list preventive measures. Proceedings of Boards of Inquiry (CF211) and Summary Investigations (CF210) also cover preventive measures and review comments by the chain-of-command all the way up to Air Command and National Defence

Headquarters. The final document on a CF211 or 210, is the DFS Closing Action Report (CAR) which is a stand-alone document providing a summary of the occurrence, the investigation, final cause factors and recommendations (preventive measures). Reading the last two years' worth of CARs, one is astounded to read time and time again "All personnel should be reminded of the hazards associated with...etc., etc. In other words "All personnel should be briefed...etc., etc."

Based on these reports, pilots have been repeatedly reminded of the dangers of unauthorized low-flying, impromptu or unauthorized air shows, press-on-itis and get-home-itis. They have been told time and time again about seasonal hazards; to keep physically and mentally fit; to adhere to regulations, orders, procedures, and instructions; to avoid white-out situations; to brush up on emergency procedures and not to forget to sign this or the other. They have been informed about the mistakes and misfortunes of others and urged to heed the lessons which can be drawn from these experiences. They have been admonished of the perils which await them should they attempt to penetrate a cumulo-granite cloud or slash through a set of powerlines. They have been cautioned not to get wrapped up in the tactical situation, not to overstress their aircraft, and not to enter regimes of flight conducive to loss of control. They have been reminded to use drag chutes on wet runways, to avoid causing engine compressor stalls, to make very sure that all flights and manoeuvres are thoroughly briefed, to do all checks as per the checklist and to stay alert and watch for other aircraft. Yes, our pilots have indeed been briefed.

Our aircraft technicians have likewise been briefed and re-briefed on following established procedures, on sticking to Canadian Forces Technical Orders (CFTOs), on following the Tool Control Programme and on ramp safety. They have been warned about making sure that all aircraft panels, caps and doors are secured before flight. They have been reminded to carry out all checks and to avoid rubber stamping. They have been urged to report deficiencies with CFTOs, to keep a tidy workplace, to use the proper tool for the job and to be careful whilst working on stands and ladders. Oh yes, our technicians have been briefed.

Management has also been briefed. Through the medium of occurrence reports, Boards of Inquiry and other means such as unsatisfactory condition reports (UCRs), management has been reminded of anomalies in technical orders, shortcomings in current equipment and the need for improving materiel and procedures. Managers have been made aware of the need for radar altimeters in all fighter aircraft, design deficiencies in some current engines and flaws in certain other systems. All levels of command have also been reminded to be judicious in the allotment of resources, to be reasonable when tasking units and bases and not to exercise undue pressure on their subordinates.

Each year, over 10,000 of you attend one of the 58 briefings given at 26 bases during the Annual DFS briefing tour. Each year, all new squadron, base and group commanders are given flight safety briefings at Air Command. Starting this year, all flight operations supervisors will receive special flight safety briefings during a two-day course at Air Command in Winnipeg. Aircrew attending staff college receive a special DFS briefing as part of their air studies curriculum. Even top management doesn't escape, they also receive special briefings by DFS on a periodical basis.

It is surprising therefore that despite the myriad of briefings supposedly attended by *all* pilots or *all* technicians, we are still seeing instances of low flying, compressor stalls, drag chute failures, overstressing of airframes, collisions with the ground, wire strikes, missing or lost tools, support equipment running into aircraft, people falling off wings and all manner of stuff is still coming off aircraft in flight. And the reports are still rolling in with the old "All personnel briefed..." Have they really? If so, IS ANYBODY PAYING ATTENTION?

What we have to do is to make absolutely sure the word gets across and assure ourselves that the message has indeed been received.

How do we do so??? Start by making sure that flight safety information worthy of a special briefing is placed on an aircrew information file (AIF) or similar device aimed at technicians, so that those not present at the briefing don't miss out. How about some changes to the standard brief—a demonstration, a stripped-down part, a brief at the aircraft or even a photo passed around. How much use is made of posters, videos, magazines and other materials that are available? Are they just distributed or are they used to make sure the message is getting out? What about local productions of posters, videos or photo displays???

If it could ever be said that an officer or NCO was followed only through curiosity I hope it is the flight safety officer or NCO and the curiosity stems from his dynamic and constantly changing form of briefing.

I am not advocating that you stop using the cure-all preventative measure "All Personnel Briefed," only that you make sure it is so. There, now you have all been briefed!

# Aviation Safety is NCO business

U.S. ARMY SAFETY CENTER

**SMA Glen E. Morrell**
**Sergeant Major of the Army**

Who has the most influence on safety in your unit? The safety officer? The commander? No. You do! You, the noncommissioned officer, have the single greatest chance to make safety happen in your unit.

Our officers have safety responsibilities, but most of those duties are to tell someone else what to do. Accidents aren't caused by talking about the job, they're caused by carelessness in doing the work. We NCOs get the work done; we're on the job watching and doing the work. We can and must make a difference. We must do our jobs right and make those who work for us do their jobs right, too.

**Check and doublecheck**

Too often, aviation accident investigations show that soldiers failed to do their jobs properly and that firstline supervisors failed to check on the work of their subordinates. Let me give you some recent examples.

• An attack helicopter lost the gunner's canopy door while in flight. The door broke free because a screw was missing from the hinge. The day before the flight, the crew chief tried to tighten the screws on the hinge. Two of the screws tightened properly, but the third would not engage. He went to look for a third screw but did not find one and gave up. A technical inspector (TI) had watched the work but left the flightline when the third screw would not engage. Neither the crew chief nor the TI wrote up the discrepancy. If either soldier had done his job properly, this $13,000 mishap wouldn't have happened.

• A crew chief plugged a cabin heat line at the quick disconnects to flush the engine of a utility helicopter. After he finished the job, he failed to remove the plugs. He also failed to record the work on the aircraft log, so no TI found the error or questioned the procedures. As a result, the aircraft was operated without the oil cooling fan rotating because the lines were plugged. The result was more than $24,000 damage.

• The bolts which fasten the vertical cyclic control tubes to the hydraulic servo assemblies were removed during maintenance. When reassembled, someone evidently failed to secure them with the self-locking castellated nuts and cotter keys. Again, the fault went unnoticed by maintenance personnel, technical inspectors, and supervisors. Also, the disconnecting of the flight controls was not logged. The results were catastrophic; the helicopter crashed, killing both crewmembers and destroying the aircraft.

• The compressor blades in the engine of an observation helicopter had, over time, become corroded by salt. The engine failed when the aircraft was hovering 150 feet above trees. The aircraft was destroyed. Cleaning the engine at periodic intervals was a scheduled procedure, but maintenance personnel did not do the work, and their supervisors failed to make sure the procedure was followed.

All these mishaps could have been avoided had maintenance personnel followed proper procedures and had their supervisors done their jobs. We NCOs must check the work being done and then double-check it.

Over and over again I find cases where minor oversights result in major damage. For example, an improperly installed cotter pin fell out of the landing gear of an airplane. The landing gear failed during touchdown, resulting in $37,000 damage. Only the skill of the pilot averted a greater disaster. In another case, a crew chief drained the oil from the tail rotor gearbox of a utility helicopter to replace the input seal. He failed to refill the gearbox and also failed to log his work. The tail rotor gearbox seized at a hover over an external load, and the helicopter crashed. This accident cost more than $4.5 million.

Don't let it happen in your unit. Pay attention to the details, and check the procedures.

In addition to forgetting to add oil or overlooking a cotter pin, soldiers also "lose" things. Unfortunately, things "lost" around aircraft are often found in very unpleasant ways. A "lost" screwdriver was "found" in the engine of a cargo helicopter after it did $77,000 damage. A "lost" socket driver was "found" in the engine of a utility helicopter, but only after it did $28,000 damage. A mechanic was working near the inlet of an operating engine on a cargo helicopter. A shop towel in the pocket of his flight jacket was caught in the airflow and pulled out of his pocket and into the engine. The engine was replaced at a cost of $42,000.

In these and many other cases, good training, good procedures and good supervision could have prevented costly outcomes.

**NCOs can make the difference**

Think for a moment about your operations. Do you know where your tools are? What about your people; do they have good tool accountability? When was the last time you checked? We have to get into the habit of continuously checking and correcting problems.

**YOU,... have the chance to make safety happen!**

The great majority of the aviation NCOs are doing their jobs well and have personally helped to prevent accidents like those I've discussed. There have been relatively few mistakes, but in aviation we cannot afford even those few—the costs in soldiers and equipment are just too high.

Each of us must set the example. We must lead our troops by showing them how to do their jobs safely.

Keep in mind that the costly shortcuts and failures to follow procedures are most likely to happen when you are not there, so make it a habit to be there. Be there. Watch. Ask questions. And don't be there only in fair weather; it's more likely the faults are going to occur when the weather is cold, wet and miserable. If your troops are out working in those conditions, get out there with them. Do what you can to improve the conditions, but, above all, make your soldiers do the job safely.

Each of you has to make safe work your personal commitment, just as I have. Remember, safety is our obligation to our soldiers; safety is mission protection; safety is NCO business.

## Decisions, Decisions

**Mr. James P. Wall**
Directorate of Evaluation and Standardization
U. S. Army Aviation Center
Fort Rucker, AL

In 1982, AR 95-1 underwent a significant revision, not only in format, but more importantly, in intent. An attempt was made at that time to permit commanders to follow the long established tradition of U. S. Army officers—command.

Directives that usurped commanders' prerogatives were deleted from the regulation and were replaced with general guidance that left decisionmaking to them. For example, commanders are told that proficiency flight evaluations are administered per the ATM, incorporating maneuvers/tasks at their discretion. The ATM then allows commanders to determine the maneuvers that are most appropriate for the evaluation. Commanders are also instructed to establish crew endurance programs using the guidance in chapter 2, AR 95-1. Once again, commanders decide what limits will be applied to their units.

This redirection of the Army Aviation General Provisions regulation was done with the knowledge that Army Aviation unit commanders are directly responsible for the success or failure of their organizations; they are closer to the problems of their aviators than anyone else in the chain of command. No one is more familiar than commanders with their units' missions and training requirements.

Because of the day-to-day contact commanders have with unit personnel, they have a special insight that cannot be put into print. This places them in a unique position for decisionmaking that cannot be adequately addressed in a paragraph of a regulation, an ATM or by a staff officer 1,000 miles away. Army Aviation unit commanders are surrounded by many talented people (IPs, SIPs, IFEs, maintenance officers and safety officers) who can provide a virtually unlimited amount of expertise in Army Aviation matters. But, all of the expertise in the world is of no value if these subject matter experts do not keep their commanders informed. Paragraph 3-29, AR 95-1, instructs all personnel to forward recommended changes to publications through their commanders. This serves a very important purpose—keep the commanders aware of what is going on in the publications that affect the decisionmaking process.

Sometimes commanders are hampered by the perception that a decision may be beyond the scope of their authority. Consider PIC selection. An OH-58 aviator who has not yet been designated PIC in that aircraft must undergo an instrument flight evaluation in his or her AAPART period. The IFE is not qualified in the OH-58. Who is the PIC? Remember that the aviator must be in ARL 1 status before an AAPART is required. The IFE cannot be designated PIC because he or she is not qualified in the aircraft, but the examinee can. Commanders have the authority to make this PIC selection for the instrument flight evaluation per the guidance in paragraph 3-21, AR 95-1. This same paragraph is their authority to select PICs daily, weekly, monthly or yearly as they see fit, to meet the needs of their organizations.

Commanders have the authority (paragraph 3-9, AR 95-1) to grant an extension of up to 30 days when an aviator fails to complete ATP requirements; any ATP requirements including iterations, ARL progression and flight evaluations. That paragraph does not give a laundry list of things that are to be considered when a commander decides if an extension is justified. The same rationale is applied to pilots in command of aircraft. They must make decisions about the operation of their aircraft based on the same evaluation process used by unit commanders. There isn't always a step of a checklist or a reference in an ATM that will cover a given situation. Aircraft checklists no longer include steps that indicate when or where some actions will be taken, e.g., turning on landing lights. Similarly, performance data may appear in graphic form in a dash 10 and in tabular form in the checklist. Which one the aviator uses is immaterial, so long as the information required for the mission is correct and is reviewed before the flight. Aviators must make numerous decisions based on a variety of factors that are not covered in a book.

Virtually everything done in Army Aviation requires a high degree of skill, judgment and the ability to make sound decisions based on evaluations of constantly changing complex situations. Army Aviation regulations and publications are designed to promote the decisionmaking process—not to restrict it.

***DES welcomes your inquiries and requests to focus attention on an area of major importance. Write to us at: Commander, U.S. Army Aviation Center, ATTN: ATZQ-ES, Ft. Rucker, AL 36362-5000; or call us at AUTOVON 558-3504, FTS 533-3504 or commercial 205-255-3504. After duty hours call Ft. Rucker Hotline, AUTOVON 558-6487 or 205-255-6487 and leave a message.***

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# AVIATION PERSONNEL NOTES

**Functional Area Management Branch**

There are changes taking place in management of Army officer assignments at MILPERCEN as a result of revisions in the Officer Personnel Management System.

Most additional specialties are now called functional areas and the management of these functional areas will be performed by separate branches in each officer career management division.

The Functional Area Management Branch in Combat Arms Division is responsible for functional areas: 18—Special Operations; 46—Public Affairs; 48—Foreign Area Officer; 50—Force Development; 54—Operations Plans and Training; and 99—Combat Developments.

The Functional Area Management Branch in Combat Support Arms Division is responsible for functional areas: 49—Operations Research/Systems Analysis; 52—Nuclear Weapons; and 53—Systems Automation Officer.

The Functional Area Management Branch in Combat Service Support Division is responsible for functional areas: 41—Personnel Management; 45—Comptroller; 47—Permanent Faculty; 51—Research and Development; and 97—Procurement. Additionally, skills 6T—Materiel Acquisition Management and 4L—Club Management also will be controlled by the new branch.

The mission of these branches is to manage, develop and assign officers designated in the corresponding functional areas. "This realignment will improve the ability to meet the Army's requirements in the functional areas and provide a home for those who single track," a MILPERCEN spokesman said.

As careers develop, some officers will single track within their branch, others will be dual tracked in branch and functional area assignments and some will single track in a functional area. "The Functional Area Management Branch configuration will enable MILPERCEN to better manage and develop officers under these various career patterns," the spokesman added.

For most officers, there will be no immediate change to their current management. Branch assignment officers will assign, develop and manage careers in much the same way as now. However, those officers who are presently single tracked in a functional area will be controlled by the new Functional Area Management Branches.

**Aviation Technical Inspectors Needed**

The Enlisted Aviation Branch at MILPERCEN needs soldiers in the MOS 67 series (aircraft maintenance) and MOS 68J (aircraft fire control repairer) to apply for the Aviation Technical Inspector Course at Ft. Eustis, VA. Applicants must:

- Be in pay grade E5 (applicants for the 66J course must be E6 or promotable E5).
- Be eligible for reenlistment.
- Meet the prerequisites for an MOS in the 66 series, as outlined in Army Regulation (AR) 611-201, "Enlisted Career Management Fields and Military Occupational Specialties."

Graduates of the course will be awarded a new MOS in the 66 series, and must fulfill one of the service obligations listed in AR 614-200, "Selection of Enlisted Soldiers for Training and Assignment."

Soldiers should send applications through their unit commanders and military personnel offices (MILPOs) to: Commander, MILPERCEN, ATTN: DAPC-EPT-F, 2461 Eisenhower Avenue, Alexandria, VA 22331-0400. DA Form 4187 (Personnel Actions Request) should be used for applications.

Training is funded by MILPERCEN. Soldiers can attend the course on a temporary duty and return basis, or in conjunction with a permanent change of station move. For more information, call MSG Walter Cole or SFC Newman at AUTOVON 221-8322 or 221-8323.

**Just the Facts**

***I recently married and need to change the beneficiaries for my death benefits. What forms need to be changed and how do I do it?***

The forms that need to be changed are your Record of Emergency Data (DD Form 93) card and Servicemen's Group Life Insurance Election (VA 29-8286), which are maintained by your servicing personnel officer. Depending on the procedures followed at your installation for military personnel office (MILPO) services, you may be able to contact your MILPO directly, or contact your first sergeant or personnel staff noncommissioned officer to make an appointment for you.

# PEARL'S

## Personal Equipment And Rescue/survival Lowdown

**Donna Bowden** photo by John E. Dixon

**You Can Live With the Buddy System**

A group of seven aircrew personnel who were off-duty headed for a local river to have some fun in the sun. When they arrived at the river bank, they immediately entered the water. One of them, a senior noncommissioned officer (NCO), indicated that he wasn't confident enough in his swimming ability to attempt the crossing. Two other members of the group swam across the river, and as they were swimming they tried to talk the senior NCO into following them. He began to swim and made it halfway and then turned around to go back. He sank before he could get back. Some of the others in the group tried to reach him but they couldn't get to him in time. Sheriff's department divers found his body 4 hours later. *When our good sense tells us we can't hack it, we ought to listen, even if someone else tries to convince us that we can.* The situation, goading someone into something they feel they cannot hack, is certainly not using the "buddy system." **Courtesy of *TAC ATTACK*, Langley AFB, VA.**

**AR 95-17 Waivers**

AR 95-17 was published 15 April 1984 with an effective date of 15 May 1984. This proliferated a rush of requests for waivers for the requirement for each crewmember to carry a survival radio. Prior to this, the survival radio shortage had surfaced at the Worldwide Aviation Logistics Conference. A working group consisting of individuals from the concerned commands was formed to attempt to rectify this problem. In the meantime, a blanket waiver was issued for 6 months to allow for an interim period of noncompliance and to ensure a minimum of one survival radio per aircraft. This waiver has since been renewed for another 6 months and will continue on a 6-month cycle until the radio shortage problem can be rectified. Other requests to give the major commanders the authority to grant waivers to AR 95-17 have been sent to the Department of the Army and have been denied. The reasoning behind this is that both DA and the Army Materiel Command Project Office are highly concerned for the safety and survivability of the Army aircrews. We realize there are logistical problems obtaining equipment and replacement parts and feel these problems should be surfaced and dealt with at the highest level to reduce the likelihood of this occurring again.

Again I reiterate that our biggest concern is the safety and survivability of Army aircrews and the enhancement of mission accomplishment. We realize that the present equipment is heavy, bulky and cumbersome, and we are taking steps to reduce the stresses and discomforts experienced by the aircrews. The research, development and acquisition process are tedious and time-consuming and we ask that you please bear with us through this transition period. Thank you for the support you provide to us through your letters and telephone calls and for your continued support of the Army aircrews.

**Cold Weather Flying and Survival**

If cool, winter weather hasn't already hit your neck of the woods, its arrival is sure to come.

The time to prepare for it is now, while you're in the cozy warmth of the aircrew personnel lounge, not after you find yourself in the thick of the cold weather that you

are sure to encounter. Preparation for any flight begins long before you ever step into your aircraft. During the winter months it's even more important that you keep physically fit, rested and ready to fly. Remember, it is easier to catch a cold during this wintry season, but balanced meals and adequate sleep will go a long way toward keeping you healthy.

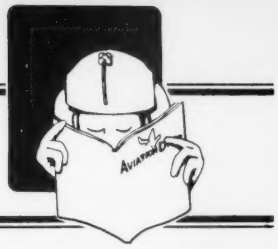
Start vour flight planning early. Plan your missions thoroughly; you probably won't be able to accomplish as much as you are used to because of increasing marginal weather. Consider the terrain you will be flying over, and please—please, make sure you wear the appropriate clothing and have the survival equipment needed to give you a chance for survival and rescue.

Again, prepare for the worst and you will surely be ahead of the game.

***If you have a question about personal equipment or rescue/survival gear, write PEARL, AMC Project Officer, ATTN: AMCPO-ALSE, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798 or call AUTOVON 693-1218/9 or Commercial 314-263-1218/9.***

***The Army Aviation Punch Bowl Ceremony printed in the June 1985 Aviation Digest is available for your unit's use in appropriate Army Aviation functions such as dinings-in or dinings-out. Seventy slides support the narration. Each is numbered and keyed in on the side of the manuscript. The Aviation Digest has several sets of these slides and copies of the keyed manuscript for loan. Write the Aviation Digest at P.O. Box 699, Ft. Rucker, AL 36362-5000, and tell us when you need the slides and when you will return them. You can call us at AUTOVON 558-3178 to request the slides. Our commercial number is (205) 255-3178. Be sure to allow enough lead time for us to mail the slides to your unit. And remember, when you have used the slides, return them to the Aviation Digest as soon as possible. There may be others waiting to use them.***

# VIEWS FROM READERS



Editor:

When the June edition of *Aviation Digest* arrived, we found the article by Mr. Bavaro on "Tank Busters" extremely interesting.

The soldiers of C Troop, one of the two attack helicopter troops in the 11th Regimental Combat Aviation Squadron, who are posed on the frontier of freedom in the Fulda Gap, really enjoyed the magazine cover in particular.

When the THUNDERHORSE Squadron reorganized under the J Series TOE in June 1984, C Troop adopted the name "Tank Busters" and a decal similar to

your June *Aviation Digest* cover which we have posted all over Europe.

Thank you for the free advertisement.

Tank Busters!

CPT Lewis E. Buchanan
Cdr, Hqs, 11th Cbt Avn Sqdn
11th Armored Cavalry Regiment
APO New York

Editor:

Last January you ran an article by CW2 Ron Moring about converting the AH-1 to the air-to-air role. This premise is a good idea. One slight problem; not enough research or knowledge was put to use in Mr. Moring's article. Let me elaborate a bit on the proposed reconfiguration.

It has been proven many times that to increase the performance of anything you first must increase the power available. In aviation, as in the "good old days" of hot rodding, you put in a larger engine to increase power levels. So let's say in the case of the new AH-1, we want to increase the power levels. We know that the designers did experiments in this area. They installed T-55 and T-64 engines in UH-1 airframes. One was called the Huey Tug, the other the 214B.

Now that we have increased the power level of the new AH-1, how do we couple the power to the transmission? This answer is just as easy: by using available parts. The AH-1T Sea Cobra uses the stronger transmission, 42 degrees and 90 degrees gear boxes, hanger bearings and drive shafts. There is no need to modify the airframe for this.

As far as the use of the four-bladed rotor system, I agree with Mr. Moring. It should be able to handle the power now available. But increased power and torque require increased antitorque. This also can be done by using parts available in the system; i.e., the larger tail rotor found on the T-Model Cobra.

Now we are getting into an area where a lot of work needs to be done to reduce the friction caused by the airframe traveling through the air.

The Soviet Hind attack helicopter, which is a current main adversary, does not hover worth a darn fully loaded. It must attain forward flight by rolling into translational lift, and must maintain forward airspeed — a high degree of airspeed. But with complete airframe cleanup, the new AH-1 should be capable of even faster flight.

The weapons station platform (stub wing) must be removed and replaced with a lift wing. This should increase forward airspeed and reduce rotor-loading in turns. Wings also will have to mount hard points for external stores, i. e., jettisonable fuel tanks (for increased range), air-to-air rockets, etc. A Malcom Hood Canopy also should be installed along with rear view mirrors, to help eliminate the now-single-pilot's 6 o'clock blind spot. A complete new nose section also will have to be added.

We must get rid of the M-197 gun system. There is no need in a single pilot aircraft for a weapon system that can traverse. In the air-to-air role, you are going to try and keep the bandit to your 12 o'clock. So let's stick in a nice little 30 mike mike. It has the knockdown power for the Hind, and the range to keep out of trouble as well. Also, we can add a GAU-2B gun pod for anything else with lighter skin. For a sighting system we have to stick with a heads-up display (HUD); the new pilot for this new aircraft should not be confused with a lot of different sights. Also, the rate of fire for the main gun should be 900 rounds per minute.

The biggest problem is the air-to-air missile. The aircraft should carry at least six. With a simple radar or infrared acquisition and lock-on, this system should be the most effective in the short-range, below-500-foot-above ground level, rapid reaction engagement which will be characteristic of helicopter-to-helicopter engagement. The missile or free flight rocket system must be simple and, most important, easily maintained.

This type of aircraft answers the Army's need for what will amount to the ground-to-middle altitude air superiority mission. Optimum configuration would be the squadron, with a minimum of 25 aircraft assigned. The primary mission should be to escort antiarmor or troop carrying aircraft. They should not be limited to the old "Charlie" or "Mike" models' use of physically accompanying escorted ships. Operating with a scout screen well in advance of the escorted elements, these craft should be able to handle anything the scouts flush out. With their superior speed they also should be able to fall back to the escorted element in the event of a flank attack.

The rest of Mr. Moring's modifications can now be used. We have now set the basic groundwork for the now uprated Cobra. The Fighter Attack—One.

SGT Linwood R. Pierce
Co. E, 150th Combat Aviation Battalion
NJARNG

Editor:

Perhaps it is only nit-picking, but as a historian I'm always disturbed to see historical errors slip into otherwise outstanding articles in official publications.

With specific reference to the article "Army Aviation Punch Bowl Ceremony" in the June 1985 issue, there are two misstatements of fact which need to be corrected simply in the interest of historical accuracy. The first is the comment that, "The 6th Transportation Company (Helicopter) . . . was the first helicopter unit to arrive incountry (Korea)." This is far from being correct as the 6th Transportation Company advance party reported to 8th Army Headquarters on 16 December 1952, and the first aircraft did not arrive until February 1953.

As early as 22 November 1950, the 2d Helicopter Detachment, attached to the 47th Ordnance Light Aviation Maintenance Company had arrived in Korea, and was fully operational, attached to the 8055 Mobile Army Surgical Hospital by 1 January 1951. The 3d Aviation Detachment arrived in Korea on 7 January 1951, closely followed by the 4th Aviation Detachment. The 1st Helicopter Detachment reached Korea on 21 February 1951. It is thus evident that although the 6th Transportation Company may have been the first cargo helicopter unit to arrive in Korea, it was preceded by nearly 2 years by other (medical) helicopter units.

The next misstatement is that, ". . . but the 2d Helicopter Detachment's H-13s did most of the medical evacuation work . . . ." Although the 2d Helicopter Detachment did yeoman work, the contributions of the 3d and 4th Helicopter Detachments must not be diminished. Although the actual numbers carried by each unit are difficult to discern due to repeated reorganizations and redesignations during the early years of the Korean War, it actually appears that at least for the year 1951 the 2d Helicopter Detachment was exceeded in its evacuations by the 3d, and closely followed by the 4th.

Just for your information, as I mentioned there were numerous redesignations and reorganizations of these ambulance helicopter units in Korea during 1951 and throughout the rest of the war. The 1st, 2d, 3d and 4th Helicopter Detachments were redesignated by Eighth Army General Order 285, 7 May 1951, as the 8190 Army Unit, the 8191 Army Unit, the 8192 Army Unit and the 8193 Army Unit respectively.

The 1st Detachment or 8190 Army Unit was made nonoperational on 14 May 1951, reduced to zero strength, and all personnel reassigned to other units. During this period, all of these units were assigned to the 8085th Army Unit, Eighth Army Flight Detachment, and were serving as attached units to mobile Army surgical hospitals.

Under the provisions of General Order 733, Headquarters Eighth Army, December 1952, the 8190, 8191, 8192 and 8193 Army Units were inactivated, and from the personnel and equipment of these three operational units the 49th, 50th and 52d Medical Detachments (Helicopter Ambulance) were formed. For the first time they were fully under the administrative and operational control of the Army Surgeon General and became an integral part of the Medical Department's Troop List.

On 3 February 1953, Eighth Army General Order 186 activated the 1st Helicopter Ambulance Company (Provisional) which incorporated not only the three medical detachments previously mentioned, but also the 37th Medical Detachment (Helicopter Ambulance). The 56th Medical Detachment (Helicopter Ambulance) was activated on 23 June 1953 by Eighth Army General Order 186 and the 54th Medical Detachment was activated soon thereafter.

In spite of these nit-picking details, I am greatly pleased to see the continuing emphasis on the history and development of Army Aviation shown by *Army Aviation Digest*. Please keep up the good work.

COL David M. Lam, M.D.
Medical Corps, Master Flight
Surgeon and Commander,
U.S. Army Medical
Department Activity (Alaska)
Ft. Wainwright, AK

**The *Aviation Digest* thanks Colonel Lam for correctly pointing out two errors in the article "Army Aviation Punch Bowl Ceremony," which appeared in the June 1985 issue.**

**On page 23, the next to last paragraph should read: "The 6th Transportation Company (Helicopter), with its H-19 Chickasaws, was the first Army Helicopter transportation company incountry, and flew the Army's first airmobile combat mission. It was in support of the 3d Infantry Division."**

**Also, on page 23, the last paragraph, 6th line, should read: "The 6th and 13th Transportation Companies helped, but the 2d, 3d and 4th Helicopter Detachments with their H-13 Sioux helicopters, arrived incountry in 1950, and 1951, and did most of the medical evacuation work."**

**Copies of the Army Aviation Punch Bowl Ceremony script with 70 keyed slides are available from the *Aviation Digest* (see address below). Also available upon request is information supplemental to Colonel Lam's about the evolution of helicopter ambulance units. It was published as "The Army Aviation Story, Part IX, Medical Evacuation," by (then) Colonel Spurgeon H. Neel and (then) Major Roland H. Shamburek, in the February 1963 *Aviation Digest*.**

Editor:

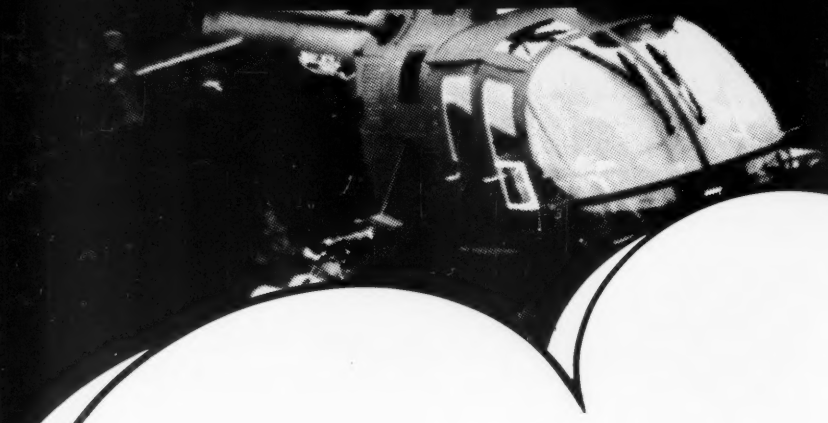
I am a general staff officer and an army aviator in the TÜRKISH Army. I am also a recent graduate of the U. S. CGSC (Command and General Staff College) at Ft. Leavenworth.

I was particularly interested in the article entitled "ARMY 21" in the December 1984 issue. I was so interested, in fact, that I have translated this article into TÜRKISH and I am seeking to publish it in the *TÜRKISH ARMY DIGEST (TÜRK KARA KUVVETLERI DERGISI.)* In order to reprint the article, I need your official approval in writing.

I appreciate your assistance and look forward to your reply.

MAJ Atilla ÖKSÜZ
Turkish Army

***Articles from the Aviation Digest requested in these letters have been mailed. Readers can obtain copies of material printed in any issue by writing to: Editor, U.S. Army Aviation Digest, P.O. Box 699, Ft. Rucker, AL 36362-5000.***



# A VIEW OVER OUR NEIGHBOR'S FENCE

## The development of NVG flying in the German Army Aviation Branch

**First Lieutenant Hans W. Ringoff**
German Army
9th Aviation Training Battalion
Aviation Training Brigade
U.S. Army Aviation Center
Fort Rucker, AL

THE MISSION of German Army Aviation is to provide the German Army an airmobile capability, augmenting its ability to conduct prompt and sustained combat incident to land operations within the North Atlantic Treaty Organization. To accomplish this mission German Army Aviation has the following tasks: antitank, transport, medical evacuation, observation, reconnaissance, command and control, and liaison. German Army Aviation is equipped with the BO-105P, BO-105M, AL-II, UH-1D and CH-53.

German Army Aviation leaders recognize the ever-increasing threat and resultant need to operate effectively 24 hours per day. To accomplish that, experiments with night vision goggles (NVGs) were conducted in 1976 at the German Army Aviation School at Bueckeburg after attempts with the low-light level television developed unsatisfactory results.

For the purpose of the experiments, a team of five experienced instructor pilots (IPs) was organized to pursue the task. That team exists unchanged today, still responsible for the further development of the NVGs and their associated systems. The team has been testing all NVGs available to it, including the American PVS-5.

After detailed experiments the decision was made to only continue with the BM 8028, which is provided by the German company "Elektro-Spezial." These NVGs had almost the same tube as the PVS-5 and also had a similar external appearance to the full-face PVS-5. The most obvious difference between the BM 8028 and

the PVS-5 is the bigger front lenses of the BM 8028, which allows these goggles to pick up more light. They also have a 48-degree field of view instead of the PVS-5's 40 degrees. Another difference between the two goggles is the connection of the focus mechanism for both tubes. An individual focus adjustment is not possible with the BM 8028, and it has the diopter adjustment directly on the eyelenses, not in front of the goggles as on the PVS-5. Experiments with these goggles continued until 1979.

Every NVG pilot who has flown full-face goggles knows their disadvantages. The most serious of those is probably that one has to change the focus in order to be able to read the instruments. To do that, pilots must remove one hand from the controls, change the focus, read the instruments, then change the focus again. All that doesn't take too long, but pilots are not fully able to fly their helicopters during that time because they have only one hand on the controls, and they cannot see outside the aircraft. To prevent this unsafe situation the goggles had to be altered drastically.

First Lieutenant Roland Lange, who just returned from a 3-year tour at the U.S. Army Aviation Center at Ft. Rucker, AL, where he became experienced flying with NVGs, was transferred to the German Army Aviation School. He was assigned to the experiment team for NVGs, and after about 3 months he had the plans ready for the first goggles that could be mounted on the helmet.

The German Army Aviation Command approved the changes and the modifications were begun. Slowly, the old BM 8028 full-face goggles became the new helmet-mounted BM 8028A. Of course, the first model wasn't perfect and improvements were made constantly. After about 1 year the new BM 8028A was completed (figure 1). All of these changes and improvements were made at the German Army Aviation School and with minimum assistance from the manufacturer. Due to the limited finances of German Army Aviation, a precedent on keeping the modification costs down was made. As a result, modification of one set of goggles, for example, cost about 200 Deutsch Marks or $70.

The tubes were taken out of the full-face goggles and mounted to a ball and socket joint, which is attached to a retainer plate. With this plate the goggles can easily be fixed to the helmet by simply placing it over the visor-protector shield. A rubberband, wound with flexible cable, connects the goggles to the battery case, which also is attached to the back of the helmet and too serves as a counterweight (figure 2). The goggles will operate at 2.5 to 3.2 volts. To maintain that voltage two AA-size batteries are used, allowing an operating time of about 25 hours. The battery case contains four AA-size batteries. It is a double battery case with a selector switch. Either set of batteries can be selected or the system may be turned off. A microswitch on the battery case automatical-

**FIGURE 1 (below): The BM 8028A night vision goggles incorporates changes and improvements made by the German Army Aviation School.**

**FIGURE 2 (right): The BM 8028A fully mounted on the flight helmet.**

ly turns off the set when the case is taken off the helmet.

Once on the helmet, the goggles can be fastened at any position with the help of a friction clamp, or they can be flipped up out of the way of the pilot's view.

Figure 3 demonstrates the large peripheral view attained by mounting the goggles this way. Also, figure 3 shows a BM 8028A peculiarity which separates it from all other goggles. The distinction is a spotlight located between the tubes. It is switched on and off by a microswitch mounted just below the microphone. The microswitch is operated by touching it with the lower lip. With the spotlight the pilot at any time is able to read all instruments and illuminate circuit breakers and switches on the overhead panel or on the middle console. The spotlight is only switched on when it is absolutely needed. There is only light in the cockpit for short periods and only where really needed. This has four major advantages:

- A painstaking and expensive modification of the cockpit can be omitted (just think about all the modifications and experiments the U.S. Army has already attempted).
- A "blacked out" helicopter is harder for the enemy to see.
- The eyes are not distracted and concentrate only on the image in the goggles.
- The goggles receive illumination only from outside of the helicopter and therefore produce a better view. This is particularly important on extremely dark nights. The goggles are only used to see outside the aircraft. Inside, the cockpit is scanned with the unaided eye.

The BM 8028A modification kit is compatible with the UH-1 cockpit (figure 4). It consists of a cover for the main warning lights, a cover for the segment warning lights, two covers for the radar altimeter warning lights, a cover for the compass calibration card and a cover for the go-no-go card.

FIGURE 3: BM 8028A incorporates a large peripheral view and spotlight.

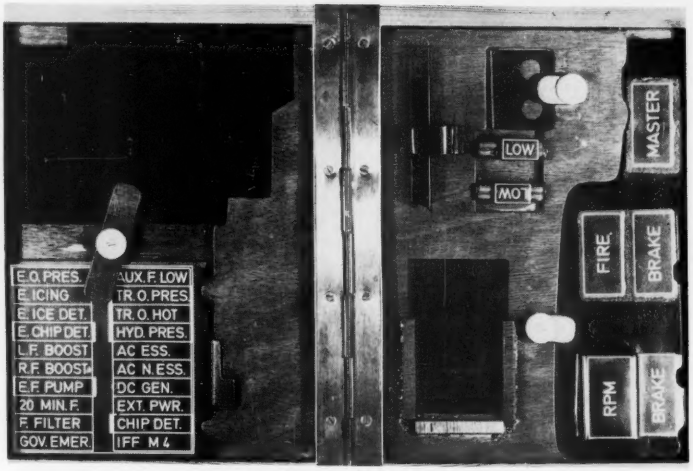



FIGURE 4: The BM 8028A modification kit for the cockpit of the UH-1 Huey.

How do pilots read their warning lights if everything is covered? The answer to that problem is rather simple; the master caution light cover, for example, has three drilled (1 mm each) holes. If it illuminates, the holes allow enough light through to be seen with either the goggles or the unaided eye. The cover for the segment caution lights also has three holes above *every caution light* that would

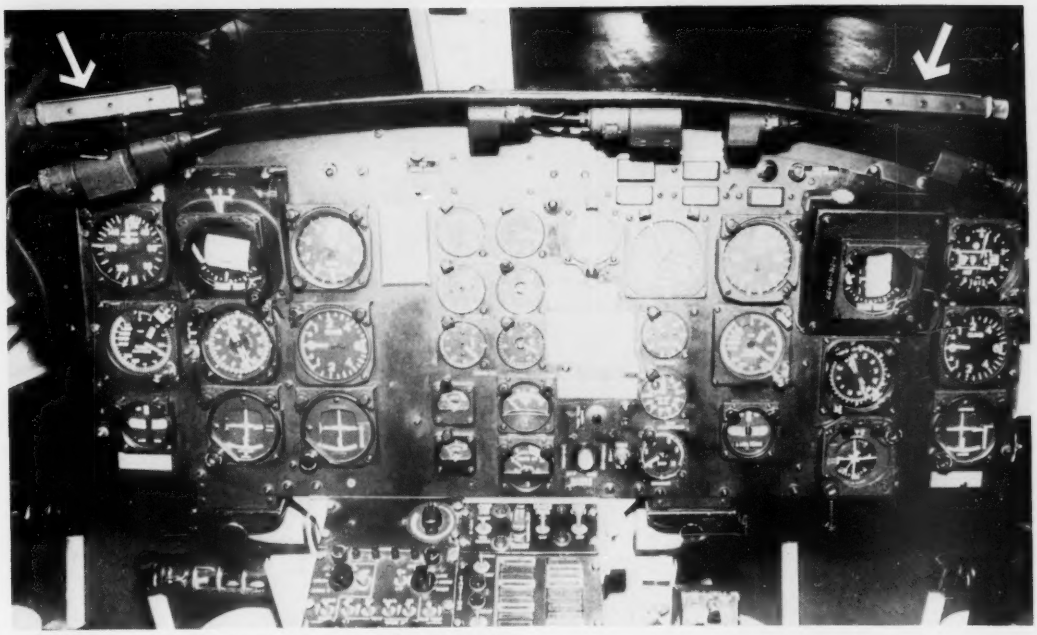


**FIGURE 5: A modification to the UH-1 cockpit (arrows).**

require an immediate landing. Above those caution lights that do not necessitate an immediate landing there is only one hole. This information is sufficient to let pilots act accordingly.

In addition to the light spots the meaning of each segment light is printed in white on black above each segment light to enable pilots to determine the malfunction with the help of the spotlight.

Besides flat black paint for the cockpit, there are no further modifications necessary. The modification kit for the UH-1 costs about $15, and that includes the wooden cases that house the covers.

These developments took place in 1979 and 1980. The goggles and the modifications on the helicopter were officially approved in 1980, and since then the goggles and the modifications have been standard equipment of German Army Aviation. Pilot training in the UH-1 began in 1980 and CH-53 training began in 1981 at the German Army Aviation School.

Unlike the U.S. Army Aviation Center, the German Army Aviation School trains only NVG instructor pilots. IPs are then sent to conduct training of pilots in their respective units. In the years following 1980, a few other things were developed which proved to be useful in flying with NVGs. One modification can be seen in figure 5 (arrows). Other than painting the cockpit, the only permanent modification to the aircraft is a radar altimeter warning light system. This system is connected to the two radar altimeters in the UH-1 and CH-53. The radar altimeter warning light system consists of two small black boxes mounted on top of the aircraft's instrument glare shields. The boxes are adjustable to the pilots' positions and situated to be in the line of sight of the pilot and copilot when they are looking through the windscreen. The boxes have three warning lights,

FIGURE 6 (above): Components of a mapreading device.

FIGURE 7 (right): Mapreading device with NVG.

each of which can be adjusted for light intensity.

The left light is steady green and connected to the left radar altimeter low altitude warning light, which illuminates when the aircraft goes below a preset altitude. The right light is flashing yellow and connected to the right radar altimeter and operates the same as the one on the left. The center light is flashing red and indicates when there is a radar altimeter system failure.

The normal operating procedure for this warning light system is to set the warning light for the right radar altimeter at the lower altitude limit (i.e., 50 feet above ground level (AGL)) and the warning light for the left radar altimeter at the upper altitude limit (i.e., 150 feet AGL). The system then gives a quick alert to the flight crewmembers whenever they exceed the desired flight envelope. Taking the numbers used before, the crew sees no light flying about 150 feet AGL; they see a steady green light flying below 150 feet AGL, *but above 50 feet AGL*; and, they will see the flashing yellow light when below 50 feet AGL.

Another useful piece of equipment developed is a mapreading device (figure 6). As mentioned, the unaided eye is used for all activities within the cockpit. A mapreading device was developed to navigate during NVG flights. It clamps to the aircraft's doorframe and is used to illuminate the map. It enables the copilot to read the map with unaided eyes and it does not interfere with the NVGs. Just by looking down, the pilot is able to look into the mapreading device with the unaided eye, requiring no movement or readjustment of the NVGs (figure 7). Since dead reckoning navigation is primarily used, the mapreading device has a liquid crystal display stopwatch mounted on the inside corner of the viewing area. This facilitates accurate timing of each leg of the preplanned NVG flight.

In Germany, time did not stand still and development of NVGs has continued. Concurrently in the United States, a major step forward was the development of third generation tubes; as a result of that progress, new Ger-

FIGURE 8: The new BM 8043 NVGs.

FIGURE 9: The improved ball and socket joint and the single clamp lever for the goggles adjustment.

man goggles are now equipped with American tubes. In direct cooperation with the team at the German Army Aviation School a German manufacturer developed a new set of goggles, which will probably be added to the inventory of German Army Aviation in 1988. The BM 8043 externally looks a lot like the old goggles but has some substantial distinctions (figure 8). As already stated, the goggles have a third generation tube. The field of view is decreased from 48 degrees to 42 degrees in order to improve the quality of the picture. The simple but effective mechanism which mounts the goggles to the helmet was also improved (see figures 9 and 10 at right).

FIGURE 10: The new spotlight which now has an NVG compatible blue-green light.

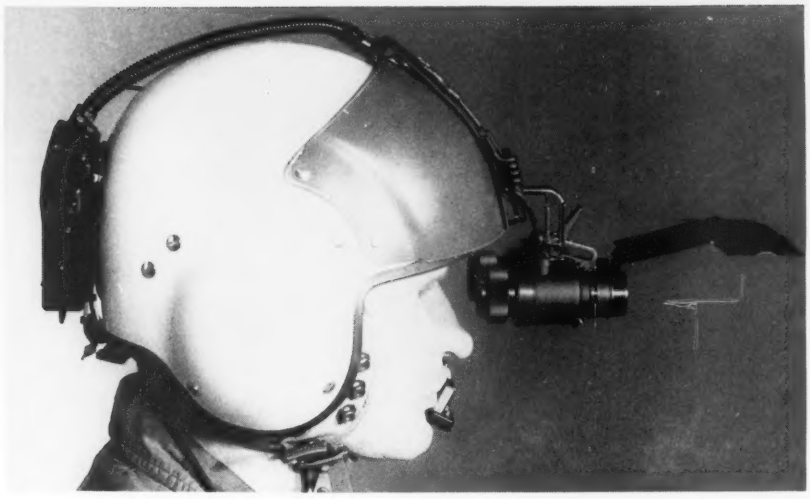


**FIGURE 11: The "moon-visor" is a special feature of the German NVGs.**

In contrast to the AN/AVS-6, the new German goggles do not offer the option of adjusting the focus range. The fixed focus range yields a clear picture in the range of about 10 meters to infinity. This appears to be a disadvantage, but since the introduction of the helmet-mounted goggles in Germany and the cut-aways in the United States, a focus adjustment has been unnecessary. Everything inside the cockpit is monitored with the unaided eye, and everything outside the aircraft is seen through the goggles. A focus adjustment is therefore no longer necessary.

The battery case was completely revised. It is still being used as a counterweight, but instead of four AA-size batteries, three 3-volt Lithium batteries are used that allow an operating time for the goggles of about 65 hours—or 22 hours on each battery.

The main switch now has four positions, "off" and one position for each battery. The microswitch, which turns off the goggles automatically if the battery case is taken off the helmet, can be overridden by another switch. This was necessary to use the goggles with a nuclear, biological, chemical suit. There is a "dim" switch on the battery case, which allows adjustment of the spotlight intensity. Through the battery case the goggles can also be connected to an external power supply. Another special feature of the goggles is a so-called "moon-visor," which is placed on top of the goggles and can be moved to various positions (figure 11). Every NVG pilot who has flown toward a bright moon low on the horizon will understand the advantages of this small device. The German BM 8043 is, in contrast to the AN/AVS-6, made of metal and not plastic. Metal has the advantage of being more durable than plastic, but metal is heavier than plastic.

The BM 8043 weighs 0.952 kilogram; the AN/AVS-6 weighs 0.856 kilogram, but the weight of the BM 8043 includes the counterweight (battery case), while the weight of the AN/AVS-6 does not include an additional 0.18 to 0.30 kilogram for its counterweight.

To navigate safely, German Army Aviation is seeking a Doppler navigation system that includes an automatic mapreader, thus increasing safety in navigation and making it easier to see and avoid dangerous obstacles.

Another improvement is a change of the instrument dials. We remove all instruments containing any radioactive material. The new instruments have an improved pointer capable of reflecting ultraviolet (UV) light. For NVG flights the instruments will be illuminated with two UV lights. The cockpit remains dark, but the instruments become visible. In case the UV light fails, the pilot still has the

spotlight to view the instruments. The UV light used is a "soft" UV light having no adverse effects on the human eye.

Why did NVG flying develop so differently in the United States and Germany? We were aware of each other's programs, but did not seek guidance from one another until the programs developed their own inertia. Another reason for different development is probably money. German Army Aviation has limited finances and must economize. Improvements and developments cannot have a high cost if they are to become reality.

The different development also lies in different philosophies concerning cockpit illumination. We are convinced that any kind of visible light in the cockpit is a hindrance, especially on dark nights. There are two reasons for this:

- The NVGs intensify all available light inside and outside the cockpit. If there is no light inside the cockpit, the goggles can concentrate on the light available outside the helicopter.
- The human eye is distracted by any visible light, and attention is divided between the image in the goggles and the illumination inside the aircraft.

Both of the above statements can be tested by any NVG pilot. On a dark night (the aircraft should be on the ground) turn off the exterior lights. Use the NVGs with the blue-green interior lights on; then turn the lights off and the image in the goggles improves. This difference could decide, in some situations, whether or not a mission can be accomplished.

Better United States-German communication, maybe even a joint development program, can be advantageous for both nations—and some dollars and marks can be saved. Hopefully this article will benefit everybody concerned, and will make flying NVGs safer and more effective for all pilots.

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- "The Care and Feeding of Night Vision Goggles," CPT (P) Jeffrey R. Murray, December 1983, page 37.
- "Night Vision Goggles Combat Effectiveness," CW3 Charles L. Murphy, January 1984, page 26.
- "ATC Action Line: Lights Out Night Vision Goggles Training," July 1984, inside back cover.
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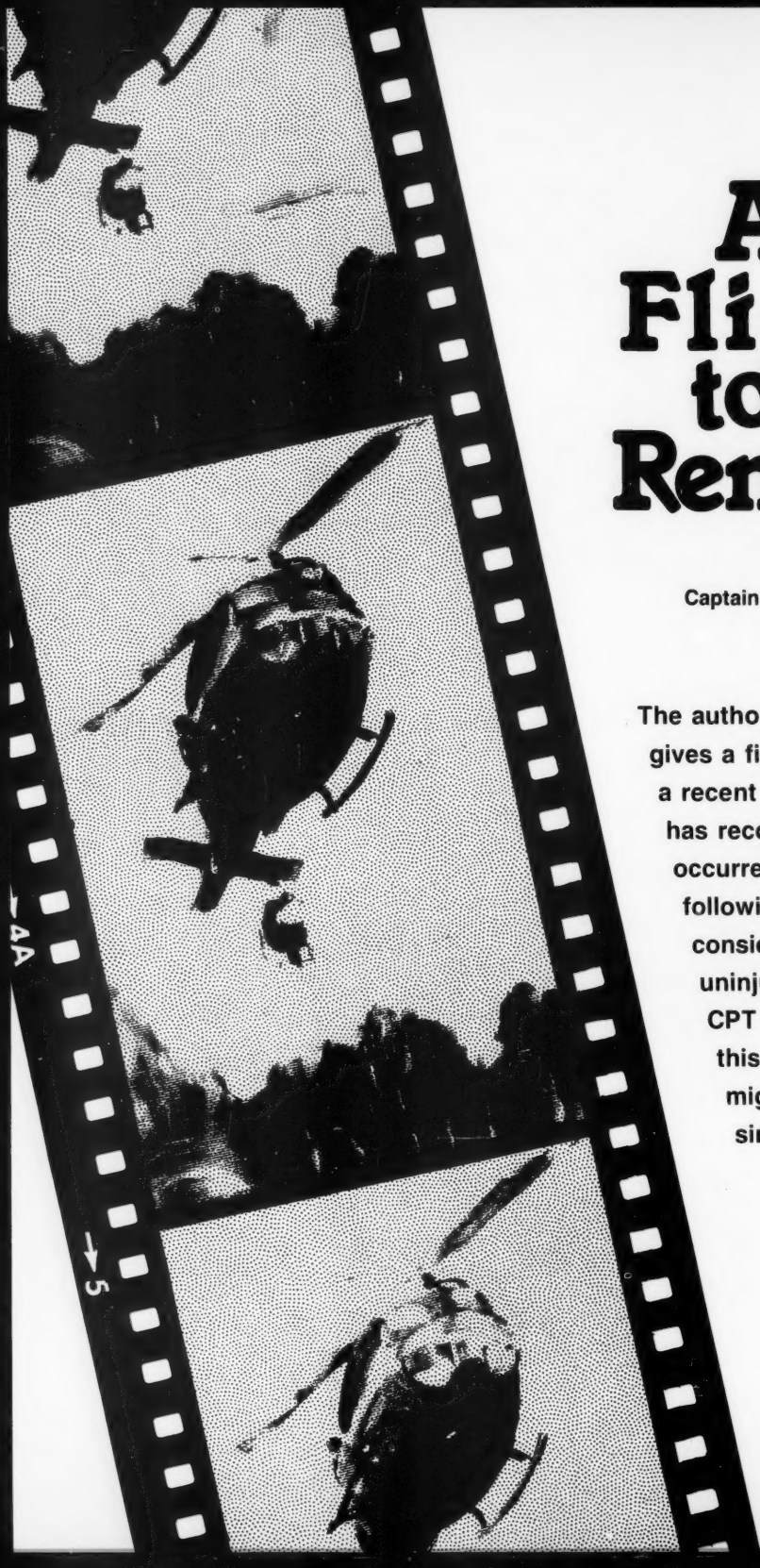

# A Flight to Remember

Captain Richard A. Read

**The author, a UH-1 Huey aviator, gives a first person account about a recent in-flight emergency. He has recorded the events that occurred during and immediately following the emergency and considers the crew escaping uninjured to be miraculous. CPT Read felt compelled to relate this to Army aviators so that it might help someone in a similar circumstance.**

TWELVE NATIONAL Guard UH-1 Huey helicopters were supporting another Guard unit on a weekend field training exercise. I was part of a flight of five aircraft that conducted two missions without incident on Saturday.

We stayed overnight in a hangar at Ft. Chaffee, AR. Sunday called for a mission to move troops from Camp Gruber, OK (near Muskogee), back to Ft. Chaffee. Everything had been prepared the preceding afternoon. Takeoff was at 0700 hours.

I was flying in the right seat. The other pilot was handling the radio calls and checking the navigation of the lead aircraft. We had two other crewmembers onboard.

It was a beautiful morning; about 65 degrees Fahrenheit and no wind. Haze restricted visibility to 7 or 8 miles. Spotty ground fog provided an attractive contrast to the wooded foothills of the Ozarks. We were the second aircraft in the formation. I had been on the controls since takeoff, about 40 minutes, when I received the first warning. I doubt I'll ever forget it.

It only blinked. The audio warning signal and revolutions per minute warning light only blinked. Maybe it is just a bad connection in the circuit and there really isn't an engine problem.

*No! It's on solid. I've really got a problem. I don't believe it's happening to me. It's always been someone else before*!

My eyes raced to the instruments. The engine tachometer was on zero but the rotor tachometer was too high.

That's not right! The engine can't be dead and also be forcing the rotor to speed up. It must be an overspeed.

I heard my copilot say, "I think we have a problem here."

I pulled in the collective pitch control to increase pitch on the main rotor blades. This slowed the rotor and brought it back within limits.

I transmitted to the other aircraft, "Engine overspeed," in as calm a voice as I could muster. It was important that they know what was happening—just in case. Speaking calmly also helped me control the adrenalin and the fear.

Increasing power had made us climb above the formation. I watched the lead aircraft go below us, and I turned to the left to avoid the possibility of a midair collision.

My copilot was responding to my identification of the problem. We continued the emergency sequence of actions for an engine overspeed.

Roll the throttle off, reduce collective, governor to emergency, roll on the throttle. Engine still on zero! No response.*

"Engine's out!" I transmitted.

Looking for a landing area: Nothing straight ahead!

Turning left; nothing!

Turning steeper; there's an opening in the trees! Bank hard—now roll out. Heading straight for it. Rotor is in the green. It's fast enough to cushion a landing, if we make it. Airspeed: 90 knots, now 100. Good!

Now I've got time to think. Nothing else to do until the bottom. No more radio transmissions are needed. They know everything by now. My copilot has been using the footswitch to talk to me and has been transmitting.

I hope we don't have to ditch in the trees. These hardwoods would be rough. We could zero out the airspeed and settle into the trees as if it were the ground. The tree limbs would help break the fall. But with the rotor turning and a 50-foot-drop—I don't know. It would still be bad.

I feel my copilot grasp his set of the dual controls. We'll both be on the controls. That's fine with me. He has a lot more time in these birds than I do.

We're going to fall short! Begin deceleration. Pull the nose up. Got to be zero airspeed if we hit the trees.

Approaching the clearing. Not much altitude left. Still going to hit trees at the edge of the clearing. Have to use collective. We're depleting some of the inertia in the rotor system that we need at the bottom to slow our rate of descent.

I looked back to my right, waiting to hear the tail rotor slice through the top twigs. Missed!

Pull the nose up more. Slow down. Rotor below the green now. Means we'll hit hard.

If the surface is sloped we may roll, or if it's plowed we may dig in and flip over.

It's grass, and flat!

Pull the rest of the pitch to cushion onto the ground. That's all. No more pitch left.

*Down—sliding—bump—sliding—.*

I was thrown forward far enough to cause my inertia reel on the shoulder harness to lock. We stopped!

Fuel off. Battery off. Got to reduce fire hazard even though everything seems OK. I don't know what the aircraft belly is like. It may have been ripped open, pouring fuel on the ground.

I'm out of the aircraft. No smell of fuel. Walking. I don't believe it. We made it. Four people uninjured—*we actually made it*!

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*At the time of this incident, that emergency procedure for an engine overspeed was correct. However, it now is:

1. Collective—increase.
2. Throttle—reduce.

If reduction of throttle does not reduce rpm as required:

3. EMER GOV OPNS—Perform.
   - Gov switch—EMER.
   - Throttle—adjust.
   - Land as soon as possible.

# A Flight to Remember

I hugged my copilot. We were great together in a serious situation. The slightest error, the smallest mistake, any misjudgment could have ended in catastrophe.

I looked overhead. An aircraft had followed us to our landing area, and now overflew us.

He knows we're OK. No assistance needed. The flight will continue with the mission and pick us up later.

The aircraft was sitting right side low, but it was in good shape. The gunmount on the right side had dragged the ground. I paced off the skid marks: About 45 meters, 3 helicopter lengths.

There's the rise in the ground that caused the bump. Here's where the gunmount started digging in. The crosstube which attaches the skid to the aircraft was bent there.

The antenna on the tip of the tail was a frazzled stub. A dent in one of the tail rotor blades and a mark on the other revealed its demise. The rotor must have flexed into it when we hit hard.

We checked the instrument indications. The compass heading was almost due north. Our original heading was about 300 degrees. Therefore, about a 300-degree turn to the left was made to get out of the formation and then find and get into a landing area.

The altimeter reads 800 feet. That was a 1,200-foot drop from our cruising altitude of 2,000 feet. Normal autorotational descent is 1,800 to 2,000 feet per minute. That means it took about 45 seconds from start to finish. There was absolutely no margin for error. I don't believe we made it!

Later, we were transported by the safety officer back to Ft. Chaffee. We ate lunch and picked up supplies needed by the two-man team that would inspect the aircraft. We were flown back to the crash site. As we approached we had a new perspective of our landing area.

It was small! It looked like the only one within reach when trouble started. There's a road on one side of the clearing and power lines are along the road. Hitting those would have been a mess. There's a house just beyond the tree line, not 150 meters away. Less than one helicopter length ahead of the aircraft was a tree, separate from the clearing's perimeter. We couldn't have slid much farther. The trees we flew over coming in were about 40 feet tall and right next to one about 70 feet. I remember having to "dogleg" our flight path to avoid the tall tree and then to align ourselves with the long axis of the area.

I still don't believe we made it. That's what even now amazes me. Someone must have been looking out for us.

Probably tomorrow the aircraft will be lifted onto a flatbed truck and driven back to Lexington. The engine will be pulled and sent to depot maintenance for a failure analysis. I hope the findings explain the malfunctions that we experienced.

We were very fortunate.

This was a flight to remember.

Note: The cause of the failure was determined to be a spur gear in the power turbine overspeed governor drive gearbox. Seizure of that gearbox caused the failure of three accessories: the overspeed governor, the power turbine tachometer generator and the torquemeter indicator transmitter. An engine overspeed did, in fact, occur. The engine, however, had not stopped. After retarding the throttle to flight idle, two quick twists of the throttle were insufficient to evoke a recognizable response in the engine. $N_2$ was still on zero and no change in torque was perceived by the pilot. The failed tachometer complicated correct interpretation of the actual condition of the engine. Insufficient time prevented further diagnosis of the problem.

A fragment from the failed gear was found lodged in the engine oil pump causing that unit to fail as well. Therefore, actual engine failure was imminent. Both pilots, Richard A. Read and Donald E. Hubbard, were recommended for the Broken Wing Award, which CPT Read was awarded.

## ABOUT THE AUTHOR

**Rick Read, the author, is a captain in the Oklahoma Army National Guard, presently serving as 1st Airlift Platoon leader, Company B, 149th Aviation Battalion, OKARNG, Lexington, OK. Rick is a 1973 graduate of the United States Military Academy at West Point, NY. He was graduated from flight school at Ft. Rucker, AL, in 1976 as the Distinguished Graduate of his class. After 5½ years of service, he left the Army and is working with industry.**

The sector of research and development that provides Army Aviation with an *extensive* technology or data base gets little publicity; consequently, most soldiers aren't familiar with it. The author explains the purpose of the tech base and its role in the concept and design of newly developed Aviation weapon systems.

# ARMY AVIATION TECHNOLOGY BASE

## WHAT IS IT AND WHO CARES?

**Mr. Donald R. Artis Jr.**

HOW MANY TIMES in your career have you asked yourself, "If we can put a man on the moon, why can't we etc., etc., etc."? The answer almost invariably is: "Because no one has considered it important enough to put the resources behind it to solve it!" Of course, some things just are not *ever* going to be "solved."

I'm sure you can think of many examples on your own. What I explain here is how Army research and development (R&D) is trying to get those answers for you. To be more precise, "Why can't we?" or even more importantly, "How *can* we?" This article covers a portion of R&D, known as the technology base, which I believe answers these questions.

The objectives of the technology base, or tech base as it is more commonly known, are many. It provides, as the name implies, a data base from which future weapon systems can draw to pick and choose their required capabilities. The data that supports the specification of a particular capability in a weapon system (such as a new rotorcraft) is developed over a long period of time; years in most cases.

Some false starts, failures and even mistakes are bound to occur. That is part of the learning process, and that is also one reason why we do tech base work. We are trying to reduce the risk of proceeding with the development of a major weapon system. That then raises the question of the return-on-investment (ROI) of the money we spend on the

tech base. I'll answer that later, following an explanation of the process by which we get the work done in the tech base and pass it on to the system engineers for possible incorporation into a weapon system(s).

The reason a particular piece of work is done in the tech base is because a value judgment has been made by a technical director of a major subordinate command that the work is supportable from an ROI standpoint. He thinks that getting the work done would fulfill one or more of the objectives of the tech base. Those objectives are to:

- advance technology with future military applications,
- ensure awareness by the Army of new scientific developments,
- avoid technological surprises that could cause premature weapon system obsolescence,
- minimize need for state-of-the-art breakthroughs that would be necessary to successfully field a new weapon system,
- encourage innovative applications of new technology, and
- provide technological advances necessary to maintain qualitative superiority.

In the remainder of this article, I explain the Aviation tech base. But of necessity, it cannot be explained in detail because the Aviation tech base is multifaceted and involves many work elements. To achieve the objectives of the tech base, the work must be done before the life cycle of a weapon system begins. Considerable generic work is necessary to explore the various ways to achieve these objectives. The type of money used to pay for that work is called 6.1 ***(research)***, 6.2 ***(exploratory development)*** and 6.3A ***(nonsystem advanced development)***. In terms of phases, that type money pays for ***research, exploratory development*** and ***demonstrations,*** respectively.

Tech base money cannot be used to pay for R&D associated with a specific system or end item. System specific R&D is funded and managed by a project manager or readiness project officer. The funding and management of system specific R&D is another story (not addressed here). Tech base money *can* be used to fund concept exploration generic in nature, such as the analysis of the future advanced cargo rotorcraft, but not for support of current systems, such as the CH-47 Chinook and CH-54 Tarhe aircraft. Generally the various phases of tech base work do the following: ***research*** exploits science; ***exploratory development*** evaluates technical feasibility; and ***demonstrations*** show technical enhancement.

Three sources are used to provide general direction for the tech base: (1) Department of the Army (DA) Long-Range Research, Development and Acquisition Plan; (2) the Five Year Defense Plan (FYDP); (3) Congressional, Office of the Secretary of Defense and DA guidance.

Based on these inputs, the development commands establish priorities for their proposed work and submit their priority lists to DA for review or revision as appropriate. Following that review, the finalized list(s) is used to help develop the next program objective memorandum (POM). The POM is the planning document used by the Department of Defense to structure programs, and is the basis for the next FYDP. The POM covers a 5-year timespan.

The first year of the POM is called the target fiscal year and is the basis for the next budget submitted to the Congress by the President each January. That, then, is the budget cycle (very simplified) you hear so much about during the year. If a particular item is not in the budget when submitted by the President, you are probably going to wait until the next budget cycle to get it funded. Some exceptions naturally exist, but they are rare and generally do not exceed 10 percent of tech base funding.

The flow of work from one level of the tech base to another is fairly easy to visualize. Aviation work in ***research*** is concentrated in four areas:

- Aerodynamics.
- Structures.
- Propulsion.
- Avionics.

Work in these generic areas exploits the science associated with each area. As the science associated with each area advances, the work is assessed and, where appropriate, picked up for further development by one of the Army's Aviation laboratories or directorates as part of ***exploratory development.***

Aviation ***exploratory development*** work is broken into two groups: integration and technology. In essence, the funding of the technology portion of Aviation ***exploratory development*** has a slight constant growth, but the integration work will eventually be completed and the funding terminated.

The technology group includes:

- Aerodynamics.
- Structures.
- Propulsion.
- Reliability and maintainability.
- Safety and survivability.
- Mission support.
- Subsystems.
- Avionics.
- Weapons.

The integration group currently includes:

- System synthesis.
- Second generation comprehensive helicopter analysis.
- Aircraft/aircrew integration.

The integration work is of relatively short duration (less than 5 years) whereas the technology work is intended to be, what we call, a level-of-effort.

Since ***exploratory development*** evaluates technical feasibility, the work we support for Army Aviation is for the purpose of evaluating the relative merit of various technologies. That evaluation is *not* for the purpose of applying a fix for a specific system problem. Rather, it is to develop technology that would counter a potential adversary, or it is to evaluate a possible technological opportunity.

The last phase of the tech base is ***demonstration,*** which uses 6.3A money. Its purpose is to enhance technology in a specific area or for a specific function. In Army Aviation, we have conducted or are conducting demonstrations in the following areas:

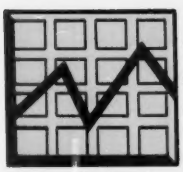
- Aeromechanics.
- Propulsion.
- Structures.
- Aviation electronics or avionics.
- Weaponization.
- Aircraft survivability.
- Aviation life support equipment.
- Mission support.
- Systems integration.
- Simulation.

We conduct demonstrations on an as needed basis. Work in these areas must be individually justified and is not a level-of-effort. Funding for these programs goes from one extreme (sufficiency money) to the other (no money). The programs within each area have definite start and stop points. However, there are not necessarily programs ongoing at any one time within each area.

To identify specific projects for tech base R&D, we look in three general areas: *threat responses, technological opportunities* and *concept-based acquisition.*

For the *threat responses* and *technological opportunities* inputs, it is fairly easy to envision how we come up with specific proposed projects. However, *concept-based acquisition* is a little harder to visualize.

Since the tech base cannot do system specific work, the analyses and work done must be generic in nature.

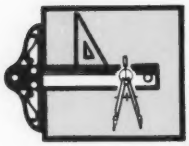


Examples of projects that can come from a *concept-based acquisition source* would be parametric studies of ground refueling techniques; analysis of methods to acquire and transport external cargo; and methodologies for analysis of performance improvements required to enhance nap-of-the-earth flight. These concept assessments can come from many sources, but generally there are only two: U. S. Army Training and Doctrine Command (TRADOC), the combat developer and U. S. Army Materiel Command (AMC), the materiel developer. There are three other combat/materiel developer agencies that also conduct R&D (the Corps of Engineers, the Surgeon General and the Deputy Chief of Staff for Personnel), but I only address the AMC/TRADOC input here.

The combat developer's primary interests are, in terms of tech base time projections, relatively near-term; that is, 5 years or less in impact potential. It might be easy, although not necessarily accurate, to think of the phases of the tech base in terms of when you could normally expect to see the work influence what is fielded. For ***research,*** it might not influence the system for 15 to 30 years; for ***exploratory development,*** 5 to 20 years; and for ***demonstration,*** 5 to 10 years.

This obviously can vary greatly from project to project and does not reflect a wartime urgency. Given a wartime need, the process can and does speed up dramatically. With that in mind, think of the combat developer influencing the tech base by providing broad guidelines, thrusts and/or objectives for consideration by the materiel developer when selecting which work should be funded.

The materiel developer considers the combat developer's guidance, reviews industry proposals and ongoing work, looks at completed studies, and reviews what the Government labs are doing and have done.



By maintaining a continuing dialogue between the combat and materiel development communities, the tech base can provide the continued technical excellence of our equipment. Since it is clear that Congress and the American people have no intention of matching the Soviet buildup numerically, we must be capable of countering numbers with quality. Hence, superior technology is essential if that is to be achieved. By looking at how the combat developer envisions that we will operate in the future (concepts) and before those concepts are turned into doctrine, the materiel developer can exploit creative thinking and innovation and develop the qualitative edge we must have.

Because we must be so much better qualitatively than our Soviet counterparts, the demands on our weapon systems to perform are tremendous. The current draft Army 21 concept envisions some very demanding missions for our aviators. Objectives of work in the tech base will be to:

- enhance our battlefield lethality and sustainment,
- improve our ability to acquire targets,
- perfect our command, control, communications and intelligence functions, and
- maximize soldier (aviator) performance capability.

We must reduce crewmember workload and the maintenance burden; strive for easier, more efficient operations; and try to do more functions with fewer systems.

To assess the value of investing money to do tech base work, I believe one needs to understand what is meant by return-on-investment. Basically, an ROI would have a savings in procurement and operating costs that would be realized during the life of a major system, and this can be attributed to design features made possible by the tech base program. Below I discuss two areas in which we did tech base work and that have since been incorporated into newly developed Army aircraft—advanced technology engines and crashworthy design features.

Work had been done in the mid-1960s on tech base components for advanced technology engines that was combined into a demonstrator engine program called the 1,500 shaft horsepower Advanced Technology Demonstrator Engine. That ***demonstrator*** program pushed technology by reducing engine weight and fuel requirements and improving engine responsiveness. Some benefits that resulted included more efficient aircraft operations (higher payload for a given gross weight), less fuel required, decreased empty weight, and improved reliability and maintainability. The T700 engine, currently powering UH-60 Black Hawk and AH-64 Apache helicopters, was the beneficiary of that technology base work. As an example of dollars saved, fuel savings per flight hour for the UH-60 are around 31.5 gallons or 200 million gallons saved over 15 years! The fuel savings *alone* justified the development of that engine. That does not even count the savings in maintenance manhours, aircraft that did not crash because of a better engine, or the fewer aircraft required to conduct the mission due to more power available.

The work we sponsored under ***exploratory development*** and ***demonstrations*** to improve aircraft crashworthiness has been incorporated into the UH-60 and AH-64 aircraft. Those features include crashworthy fuel systems, energy absorbing seats and landing gear, and high-strength airframes. The crashworthy fuel system included consideration of fuel cell placement, incorporation of breakaway fittings and design of high-load tolerant fuel cells. High-strength airframes included retention of high-mass components to protect aircraft occupants. *Studies projected that in 1,200 survivable accidents, if the aircraft had a crashworthy fuel system, 1 thermal fatality and 5 thermal injuries would occur; without the system, 65 thermal fatalities and 25 thermal injuries would occur!* That alone is sufficient justification to have done that work.

The title of this article contained a phrase, "Who cares?" I believe *you* should care. What is at stake is our future. Your sons and daughters will be using the aircraft technology that we are working on today in the tech base. The tech base is our investment in the future. We in R&D realize that there is no room for waste either in time or dollars; that there is an increasing need for *closer cooperation between the combat and materiel developers; and that we must exploit independent research and development being done by industry and the academic communities.*

In addition to Aviation, I believe in the future you also will see enhanced use of technology *demonstrations* in other areas, such as the Advanced Integrated Propulsion System for future heavy land combat vehicles. Aviation's use of demonstrators has helped us push the state-of-the-art of Aviation. The other branches of the Army see the benefits of tech demonstrators and are likely to join in.

After looking at the work going on in our laboratories, some individuals have been heard to say that they thought they were looking at "hobby shops" and not productive work intended to solve real-life problems. It may appear that way to some, but I am hopeful that after reading this article *you know* that hobbyshopping is not going on. Rather, work is occurring to support the technology base.

But, if you still wonder what the tech base is doing for you, remember the 5-, 10-, 20- and 30-year impact statements I talked about earlier in this article. If you can visualize the impact that way, you will readily see the value of the tech base to help solve your long-term Army Aviation problems. Then the answer to the question posed in the title *is, "I care!"*

ABOUT THE AUTHOR

**Mr. Artis is an advisor to the director of Army Research and Technology, Department of the Army for the aerospace and mechanical engineering concerned with Army Aviation exploratory and advanced development. He prepares the Army's Aviation technology base portion of the Department of the Army Long-Range Research, Development and Acquisition Plan for the program objective memorandum and budget preparation cycles. He coordinates with the appropriate combat and materiel developers to ensure a responsive technology base. He makes sure that Aviation technology programs are responsive to current and projected Army Aviation requirements.**


## U.S. Army Class A Aviation Flight Mishaps

| | Number | Flying Hours (estimated) | Rate | Fatalities | Total Cost (in millions) |
|---|---|---|---|---|---|
| FY 85 (to 31 December) | 12 | 368,802 | 3.25 | 8 | $13.7 |
| FY 86 (to 31 December) | 9 | 365,141 | 2.47 | 2 | $10.8 |

U.S. Army Information Systems Command
ATC ACTION LINE

## UNSAFE HELICOPTER OPERATIONS?

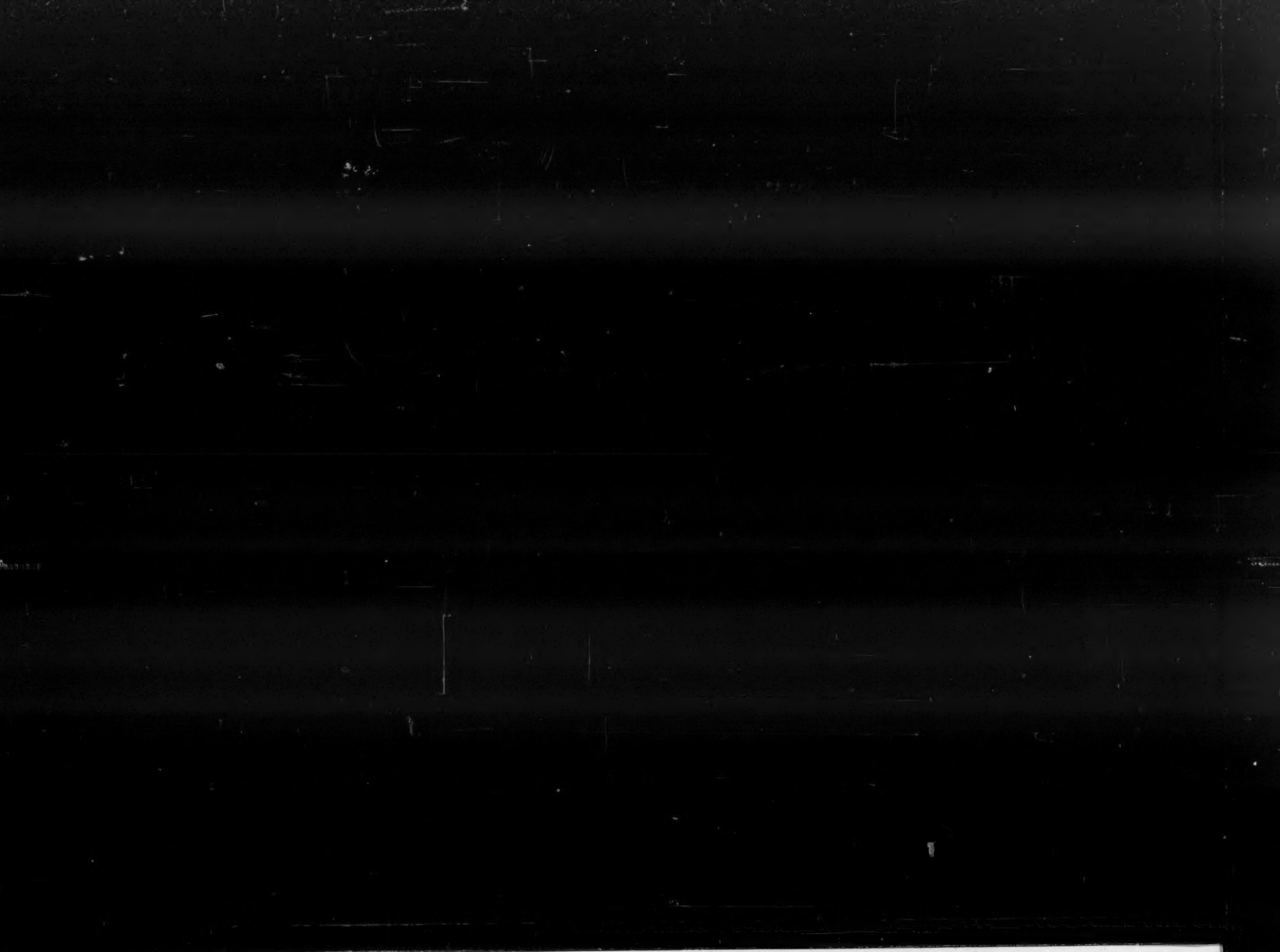
DURING THE PAST several months the Department of the Army Regional Representatives have received complaints from Federal Aviation Administration (FAA) field personnel pertaining to their inability to see some Army helicopters during nighttime operations. This appears to be the result of some helicopters operating at night near airports with their lighted position lights in the dim mode or else turned off.

Operation at night with position lights off is in violation of Army Regulation (AR) 95-1 and the Federal Aviation Regulation (FAR) Part 91.73. Both of these regulations require position lights to be turned on between official sunset and sunrise. The only exception to the above is when night vision goggles (NVG) training is being conducted in accordance with the Grant of Exemption issued to the Army by the FAA for NVG training. The Grant of Exemption authorizes Army aviators, at their discretion or at the direction of their commander, to turn the helicopter position lights off during actual NVG training when in an approved training area or in an airfield traffic pattern where nonparticipating helicopters are not a factor and suitable measures for collision avoidance are instituted.

Operation of Army aircraft at night with lighted position lights in the dim mode is not a violation of AR 95-1 or the FARs; however, it may not be the prudent thing to do. Did I hear someone say that such operations would be in violation of FAR Part 23, 25, 27 or 29? Not so! These FAR Parts do not apply to military or other public use aircraft. (FAR Part 91 does apply.)

The practice of conducting night operations near airports with position lights on dim may be a spinoff from the NVG training program. During the early stages of the NVG program it was discovered that aircraft lighting interfered with the training process. Personnel at the Army Aviation Center, Ft. Rucker, AL, developed a technique of taping over a portion of the helicopter position lights and then conducted the training with the lights in the dim mode. Initially the lights were to be in the dim mode only when in an actual training area or in a stagefield traffic pattern where nonparticipating aircraft were not a factor. Flying from the Army airfield or staging area to the training area and back again was to be done with the position lights on bright. With the proliferation of the NVG training program throughout the Army, commanders and aviators are not as careful in adhering to the above procedure.

The Army Aeronautical Services Office believes that a problem exists and that something should be done to correct it; it has referred the problem to the Army Safety Center at Ft. Rucker for consideration. A measure that might correct this situation would be to modify paragraph 1-17, AR 95-1 to provide specific guidance.

Comments concerning this article should be addressed to Mr. Jesse M. Burch Jr., AUTOVON 284-7796/6304.

***Readers are encouraged to address matters concerning air traffic control to: Director, USAATCA Aeronautical Services Office, Cameron Station, Alexandria, VA 22304-5050.***